

RAILROAD GAZETTE

SATURDAY, MARCH 1, 1873.

The Pierce Elastic Frog.

This is the invention of Mr. D. C. Pierce, and is thus described by the parties who are manufacturing it:

"It is intended to produce an elastic frog that will have a continuous connection with the rails so as to avoid the usual shocks in passing through them, and one that will permit of being renewed without necessitating the tearing up of the rails and bed and, after this is done, keeping a large force to reconstruct old frogs; all of which is accomplished in this way:

"The bed is made of cast iron of say 600 pounds weight for a six-foot frog, with pockets in either end for securing the rails.

"On the top of the cast-iron bed is fitted a solid cast-steel cap, weighing 200 pounds, which is let into the bed in such a way as to be secure from being moved either end or sideways, after which it is fastened down to the bed by both having lock nuts on them as a double security.

"This cast-steel cap, from the depth of its cross-section, in addition to the $\frac{1}{2}$ inches of thickness of swing rails or wearing surface is calculated to be strong enough to avoid the possibility of fracture.

"Between the cast-iron bed and the steel cap is placed the elastic material, which is so arranged as to cover the whole surface of the frog, as will be perceived by referring to Fig. 1, which shows the bottom side of the steel cap for that purpose.

"The elastic material may be of different kinds; prepared wood or rubber is preferable, one-eighth of an inch in thickness of either being considered sufficient to break the shock of passing wheels. The construction of the bed is such as to prevent the elastic material from working out, and experience has demonstrated the fact that the elastic material will last as long as the cap, which of course depends upon the amount and severity of usage it receives.

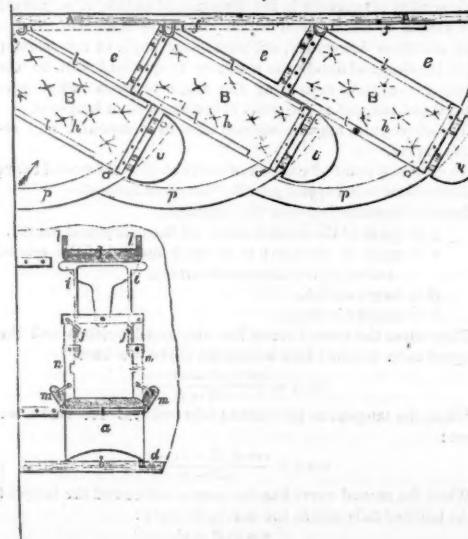
"The continuous connection of this frog is made by continuing the wing rails of the cast-steel cap past and outside of the ends of the connecting rails. In practice four inches in length is found to be sufficient to prevent any shock from that quarter, and also prevent the laminating the ends of the connecting rails. The heel of the steel cap is permitted to pass between the two connecting rails and thus secure the continuous connection at that end.

"The steel cap is secured to the bed by bolts, having lock-nuts, as before stated, and so arranged that they can be unscrewed with ease without disturbing any other portion of the frog or rails, and thus enable two men to place a new steel cap in position by simply unscrewing the bolts, removing the old steel cap and dropping a new one into place, all of which can be accomplished in from 15 to 30 minutes, thereby avoiding the usual delay to trains while such repairs are being made, the necessity of keeping a large force at work constantly repairing frogs, saving the transportation of heavy frogs to and from the repair shops, and the necessity of carrying such a large amount of expensive stock in the way of duplicates."

It is manufactured by the Pierce Frog & Crossing Company, corner Sixth and Carr streets, Cincinnati.

New Plan for Sleeping Cars.

Notwithstanding the gorgeous upholstery and other magnificence of sleeping cars, they are patronized by many people



only because they are the least of two evils, and who find that the discomfort of badly-ventilated cars and personal propinquity to disagreeable people is somewhat less than that caused

by the fatigue of sitting up all night. If, however, some arrangement could be devised by which the ordinary seat could be converted into a couch and the traveler could recline on it during the night, it would, we believe, be preferred by a large proportion of travelers. Our engraving represents such an invention, which was devised and patented by Mr. John L. Hamilton, of St. Joseph, Mo.

Fig. 1 is a plan showing the arrangement of the seats, and fig. 2 a transverse section of one of them.

A in the engraving represents parts of the car-body, within which a suitable number of seats, B B, are set up at proper distances apart. Each seat is, by one leg, a, next to the side of the car, pivoted to the car bottom b, the leg having a pivot-pin d, which enters a socket in the car bottom, as shown. The seat can on this pivot be turned at an angle of about forty-five degrees to the side of the car, in which case, by the interposition of a triangular plate, e, between the end of the seat and the car, an extension is effected fitting it to a berth. This extension-plate e rests on a rib, f, that projects from the side of the car, and by projecting dowels, also, on the end of the seat. By being thus swung into the oblique position, as is shown in Fig. 1, the seats are brought close together and utilize, consequently, to the fullest extent, the space in the car, the extension e being sufficient to convert each seat into a comfortable couch. The back h of each seat is pivoted at the ends in the ordinary manner, to be reversible, and can be sustained horizontally above the seat on frames i i that slide in the ends of the seat, as indicated in Fig. 2. The frames i, when elevated to sustain the back, are locked by suitable catches j. The back constitutes in this position another couch above the seat, and receiving an extension, e, similar to the other, will be equally long and comfortable. The outer part of the seat may be supported on a circular metallic track, p, sunk into the floor of the car, and arranged with sockets or catches, or both, to lock the seat in its several positions.

Fireholes of Locomotive Boilers.

Among the numerous improvements in the constructive details of locomotive engines which have lately been designed and patented by Mr. F. W. Webb, the locomotive superintendent of the London & Northwestern Railway, is the mode of forming the ring round the firehole door of locomotive boilers, which we illustrate by the subjoined figures. This plan consists in boring holes in the inner and outer plates of the firebox, and in turning a ring out of soft metal, such as copper, so that its ex-

THE PIERCE ELASTIC FROG.—FIG. 1.

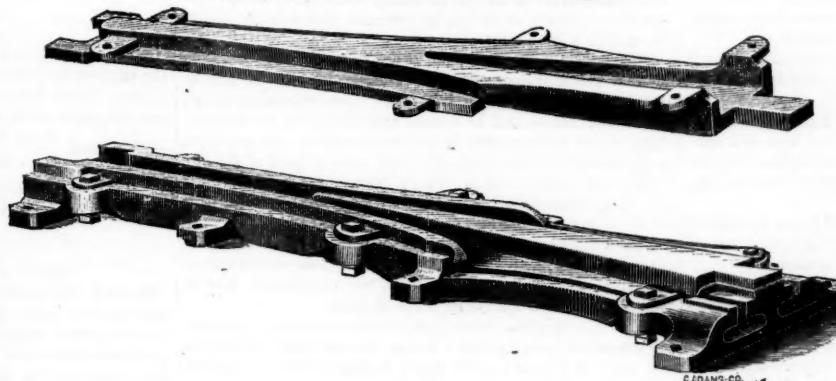


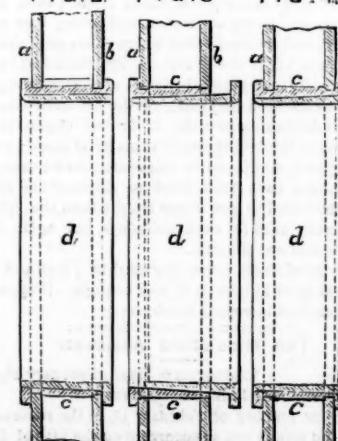
FIG. 2.

terior diameter will just fit these holes, and in forming (if desired) two grooves in the outer surface of this ring to come

FIG. 1.



FIG. 2. FIG. 3. FIG. 4.



opposite to the inner and outer plates of the firebox, the grooves being, say, about $\frac{1}{2}$ in. deep, and of such width as to fit the plates. This ring is also provided with a flange, and into it is forced another ring (having a flange), of hard metal, such as iron or steel, both rings being sufficiently coned to correspond, so that the soft metal ring will be expanded, and the grooves in its exterior made to grasp firmly both the inner and outer plates of the firebox, and completely fill the hole, so as to be steam-tight. The smaller end of the inner hard metal ring is then slightly riveted over to give further security.

Figs. 1, 2 and 3 illustrate this arrangement; fig. 1 being a side view, and figs. 2 and 3 cross sections. In these views a and b are the plates forming the sides of the firebox, c is the soft metal ring, and d the hard metal ring. Fig. 3 shows the rings in position before the inner ring is forced up. Fig. 2 shows the inner ring forced up, and the soft metal ring expanded to its fullest extent, and the thin end of the inner ring slightly riveted over the flange end of the soft metal ring. Fig. 4 is a section, showing a slight modification in the form of the rings. This is a simple mode of forming firehole rings, and appears likely to make a thoroughly good job.—Engineering.

Contributions.

A Southern Trip.

To THE EDITOR OF THE RAILROAD GAZETTE:

I have just recovered from the effects of a journey to Alabama and back. A description of how railroads behave themselves in that region may prove of interest to those of your readers who have been so fortunate as not yet to have realized the miseries there awaiting them.

Commanding myself and all my fortunes, one Tuesday evening at 8:30, to my guardian angel *pro tem.*, Pullman, I slept soundly, in somewhat suspicious tranquillity, until 7 next morning, when an unkind porter awoke me to the fact that we had missed connection and would have to spend the livelong day on the banks of the great Father of Waters. One hundred and ninety-five miles in twenty hours was the progress we had made by 6:30 p.m. on Wednesday, when we started a second time, over an extensively-advertised "through route." No sleeping car on this "through route" until 11 p.m. At the earliest possible moment after that hour we stretched our weary limbs to rest on the luxurious softness of a Pullman lower berth. Ah, cruel fate! Ah, inexorable porter! Five o'clock came, alas! too soon, and discharged we were, in the cold, gray dawn, to seek another and a less comfortable resting-place. In the middle of the "through route," in the middle of a consolidated line 321 miles long, for no apparent reason, we change trains, wait two hours and then proceed. At 5 p.m. we again change cars and go off on a different line, keeping on that line until 1:18 a.m. No sleeping car on this route. On Thursday evening at 4:15 we started in another direction, change cars twice by 9 p.m., having had to wait per schedule half an hour at one place and three-quarters of an hour at the other. Now we secure a sleeping berth until 5 a.m., when we are discharged, according to the custom of this inhospitable region, and slowly, sadly, wearily continued our journey until 10 a.m.

Hoping, against experience, for better things, we started on the return journey at 8:30 a.m. next morning (Sunday); 11 p.m. found us at a junction on time, waiting for connection which was not due until 3 a.m.; four hours in such a waiting room. Four a.m. found us at another junction on time, waiting for a connection due at 6 a.m.; two hours more of patience on a hard seat. Six a.m. came not too soon, and then began our ride over the consolidated line before mentioned, with the usual change of trains in the middle. At 11 p.m. we were at another junction with the O. K. schedule interval of two hours; waiting room, 10 feet square; no fire, no light. At 1 a.m. we started, went 9 miles and side-tracked in the wilderness until 7 p.m. next day—18 hours.

A south-bound train had gone off the track at 8 p.m. To describe the operations that followed, let us designate the terminus of one of the great trunk roads as C, a turnout in the wilderness as B, a junction of the above-mentioned road and another important one as A. Train went off the track two miles north of B—11 miles from A. Three hours later wrecking train started from A. North-bound train arrived at A on time—1 a.m. Station operator had said "good night," and was asleep. Train went over to B and side-tracked. Terminal station was only 15 miles beyond the wreck, passengers very reasonably expected to be transferred; but no orders were given; no news from the wreck; conductor of north-bound train, coiled up in his baggage-car, taking matters coolly; quizzing and irritating passengers who were curious enough to ask pertinent questions. Morning came; no news, no orders; conductor indifferent as to fate of his passengers and enigmatical in his replies; no breakfast visible. At station A, 9 miles back, was a good saloon, where plenty of meat and drink were obtainable, but conductor and train were immovable. This was the most disgraceful piece of management I ever came across. There was not the least necessity for detaining the passengers long enough to lose connections; yet they were kept 18 hours, and then lost connections, so that 7 hours longer delay had to be endured. The wreck was as mild a nature as well could be. The engine, baggage and express cars went off the track; the remainder of train kept the rails. The engine fell clear and offered no obstruction. The two cars lay on their sides at such a distance that when the trucks were removed the bodies of the cars offered no obstruction. To repair a small piece of track and to remove the trucks of two cars not less than 18 hours sufficed!

When I reached the end of my journey I had traveled 1,756

miles in 185 hours, a rate of $9\frac{1}{2}$ miles per hour, having pushed on as fast as train facilities permitted, except on two occasions, when I stopped over between trains. In the 185 hours, sleeping cars were available twice—only for six hours each time.

"The Bud" says: "A community might almost be said to be half-civilized, civilized or enlightened, in proportion to the extent of its railroad privileges." Judged by this standard, the countries I traveled through are half-civilized. Let my experience be recorded that the coming generation may be able to measure the civilization of the Southern States in the year of grace 1873.

HINDOO.

European Practice in Making Locomotive Boilers.

To THE EDITOR OF THE RAILROAD GAZETTE:

The manufacture of locomotive boilers in England and other parts of Europe has still a few specialties, according to the different ideas of the numerous engineers of the railways for which the locomotives are required; still, in regard to the system of carrying out the work in detail, there is not now very much difference in the plans and machines required for boiler-making.

Looking first at the boiler barrel, we find that the transverse joints are nearly all single-riveted, and the longitudinal joints double-riveted.

The barrel plates are made with one longitudinal joint in each, which joint is kept in the steam space.

It is found an advantage, where there are three plates in a boiler barrel length, and a dome is required, to weld the joint of the plate where the dome is fixed; the other two plates, being jointed, are on the right hand and the other on the left hand side of the boiler.

The fire-box-casing joints, with the exception of the longitudinal joints, are made single-riveted; the covering plate and sides being made usually in three plates, though occasionally all in one.

The usual method of jointing the boiler-barrel transverse joints is with the lap joint, a method which is found simple and very convenient; though a very few of the locomotive engineers adopt the butt joint, which requires more labor, owing to the barrel rings requiring to be turned in the lathe, as well as having to plane the ends of the plates, so as to insure their coming together correctly when the barrel is being jointed.

Butt-jointing in the longitudinal joints is, however, not much more expensive than the lap joint, when butt strips are used on the outside and inside of the joints.

The holes in the boiler plates (where a number of engines are required similar in design) are marked out first on a complete set of plates; and, after being drilled or punched, the others are all marked from these, which saves a set of templets, the first set of plates being used for such.

The plates are then bent (after the holes for joints are drilled or punched), if for the barrel or crown of fire-box, in a set of bending rolls, to a gauge of the required dimension.

It is becoming usual now to drill all the holes for locomotive boiler joints, though a few still adopt punching the holes, which is found to answer very well.

When butt joints are used in the transverse joints, the rings are fitted on the barrel plates after the holes are drilled in them, and the holes are then drilled through the plates, so as to insure correctness in having the holes directly opposite one another.

The back and front plates of the fire-box casing are bent and flanged on cast-iron bending blocks, and the holes in the flanges are then marked off to suit the covering and side plates, and are then drilled or punched. The holes for stays are also marked off and drilled in fire-box-casing plates before the casing is riveted up, as well as those for the fire-door ring and bottom ring of fire-box.

The inside copper fire-box is built up independently; the holes all being drilled in the copper plates for the joints, after being marked off at a regular pitch. The bottom ring, which is of solid wrought iron, is fitted on the outside at the bottom of the copper fire-box and marked off to suit the holes.

After the joints of the copper fire-box are riveted up, the box is fitted in its place, and the holes for copper stay-bolts, etc., marked off so that they may be in direct line with those of the outer casing.

The smoke-box tube plate is usually fastened to the boiler barrel by an angle-iron ring, welded at its joint and double riveted in both flanges.

The holes for tubes in both smoke-box tube plate and copper tube plate are marked from templets and then drilled, first to the size required for the spindle of cutter drill, and then to the required diameter for tubes, by a cutter drill, the diameter of holes in the smoke-box tube plate being made usually one-sixteenth of an inch larger, so that there may be no difficulty in taking out the tubes when required for repairs, etc., etc.

The tubes are fastened by means of a tube expander (Dudgen's or other), and are occasionally ferruled at the fire-box end throughout, and at the smoke-box end, a ferrule for every sixth tube put in.

The tubes taper from 12 Birmingham wire gauge at fire-box end to 14 Birmingham wire gauge at smoke-box end, being made of brass. Solid drawn copper tubes are never used, though at times copper ends are brazed on for a length of six inches at the fire-box end, to suit the ideas of the engineers who desire it. Wrought-iron tubes are very seldom used now, as the brass tube is found to answer the purpose most efficiently and to wear better than any other.

The staying of the boiler and fire-box is next to be looked to.

The fire-box casing is stayed to the inside copper fire-box by means of copper (or wrought-iron) stays, at a pitch of not more than four inches apart vertically and longitudinally. These stays are turned and chased in the lathe to a diameter and pitch of screw, and cut off to the various lengths required to suit the taper of the copper fire-box and water spaces. An allowance of seven-sixteenths of an inch projection is left

after being screwed down into their places for riveting over and shaping the ends. It is becoming usual to turn off the screwed part of these stays about three-eighths of an inch inside the plates, which saves a little time in putting the stays in their places.

In staying the crown of copper fire-box, longitudinal roof stays are generally used, though vertical stays are occasionally put in when the weight on the hind end of engine requires to be kept as light as possible.

In the case of some engines for the Northeastern Railway of Switzerland, the sides and covering plates of copper fire-box are made "corrugated," so as to reduce the weight of stays still further.

The fixing of the longitudinal roof stays (after the ends are fitted to crown) is accompanied by screwing the bolts into the stays from the inside of the copper fire-box, a distance ferrule being used between the roof stay and top of copper fire-box, if the bolts are not screwed into the copper, the bolts near the neck being made slightly conical, so as to make a good joint.

Where vertical stays are used for staying the crown of the copper fire-box, the holes are drilled and screwed after the copper box is fitted in its place.

This latter arrangement gives a good open heating surface which can be readily got at for washing out, though there are some disadvantages connected with it, owing to the unequal expansion of the copper fire-box and the outer casing. Where longitudinal roof stays are used, the crown of the fire-box casing is stayed by double angle-irons, or T irons, and from these the sling stays are suspended for assisting in the support of the crown of copper fire-box.

Tube-plate stays for the copper tube plate are occasionally put in below the tubes, at the front of tube plate, and fixed to the bottom of the barrel next the tube plate, but are not in general use, being found difficult to get at, if they should give way after being riveted in their places.

The fire-door ring is of solid wrought iron, and is tapered vertically to suit the water space (though occasionally it is made thinner and the copper set in to suit; but the latter method very often gives trouble, from the bending of the copper plate being apt to weaken it at that point). These rings are planed before being put in their places. The fire-box bottom ring is usually slotted at the corner to give a better chance for making a good joint.

The staying of the back plate of fire-box and smoke-box tube plate is accomplished with gusset stays fixed on one end by double angle-irons to the curved plate of fire-box casing, crown and boiler barrel, and by double angle-irons on the flat surfaces, which makes a very strong arrangement. *Longitudinal stays, extending from smoke-box tube plate to back of fire-box casing are seldom used nowadays, as they cannot be depended on, having been found to break so often; and no one was any the wiser as to the time they had given way.*

This is the usual class of boiler, and the fire-box casing is made what is termed "flush," the barrel plates increasing in diameter at each transverse joint, till the largest size is reached at the fire-box casing covering plate.

Steam riveting has become very common in large engineering works for riveting boiler joints, though hand riveting is still most in use, and gives great satisfaction where care is taken with the joints. Caulking the joints is done on the inside of boilers as much as possible, when required; but as little of that as possible is done, as it is found to spoil the surfaces of the plates at the joints if sufficient care is not taken. When domes are used, they are welded in the vertical joints and flanged for double-riveting round the base; the hole in the boiler-band plate for the regulator or manhole being made oblong-shaped longitudinally, so as to reduce as much as possible the loss of strength by the plate being cut away at that part. Sometimes a ring of plate or bar is riveted round the hole cut into the boiler plate at the dome to strengthen the boiler at this part.

The forementioned particulars are what are most usual in nearly all classes of locomotive boilers, though there are one or two little alterations in designs which we may here note, viz:

The smoke-box tube plate being placed inside the barrel and flanged all round for jointing, the domes made in two parts for convenience in joining the regulator, etc.

The thickness of boiler plates varies from $\frac{1}{2}$ to $\frac{1}{4}$ inch, according to diameter of boilers.

The thickness of fire-box-casing plates varies from $\frac{1}{2}$ to $\frac{1}{4}$ inch.

The smoke-box tube plate varies from $\frac{1}{2}$ inch up to the greatest extreme of $\frac{1}{4}$ inches in one or two cases; but in ordinary practice this latter would be considered quite unnecessary.

The thickness of copper plates varies from $\frac{1}{2}$ inch to $\frac{1}{4}$ inch for back, sides and crown of fire-box, and from $\frac{1}{2}$ inch to 1 inch for tube plate, and reduced below where tubes pass through.

In the engines where the $1\frac{1}{2}$ inch is the thickness of smoke-box tube plate, $\frac{1}{2}$ inch is the thickness of copper tube plate.

Steel boilers are used frequently on the Austrian State Railways, and are beginning to make one or two engines of the English railways think of trying that material there; still they are the exception, and probably will remain so for many years.

Steel fire-boxes have been tried in England and Scotland, and have been found to give better results than the quality of copper generally used for such nowadays, but again they are the exception and not the rule.

The diameter of rivets, commonly used is $\frac{1}{2}$ inch and $\frac{1}{4}$ inch, and pitched at from $1\frac{1}{2}$ inch to $1\frac{1}{4}$ inch centers. (Copper rivets are sometimes used in copper fire-boxes.)

The Middlefield Accident.

SPRINGFIELD, Mass., February 18, 1873.

To THE EDITOR OF THE RAILROAD GAZETTE:

I see in your number of February 15, in the report of accidents, that you report one as occurring on the 24th of January, at Middlefield, Mass., in which the cause is incorrectly stated.

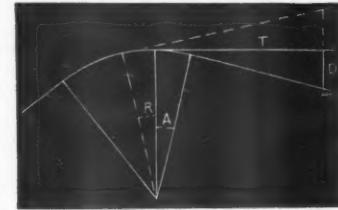
You state that a "brake fell under the car," &c.; but the accident was caused by a broken wheel on a Michigan Central car made at Detroit, which was the third car from the rear end of the eastward-bound train. The car left the track a short distance from the bridge and struck the corner, and was thrown across and into the rods and drawn across the bridge, striking and tearing out the supports of the bridge, and breaking from the train, leaving the three cars on the bridge. At the same time a train from the East was approaching the bridge, but too soon to be signaled to stop, and ran on to the bridge. The engine had arrived to about the center when the bridge fell, carrying down the three cars from the eastward-bound train and three cars on the west-bound train, besides the engine and tender. The engineer and fireman and one brakeman belonging to the west-bound train were killed; others were bruised some, but not badly. The above are the facts, I believe. The bridge is again in its place. It was of 80 feet span and about 20 feet above the water.

To Change Point of Curve.

CLARKSVILLE, Texas, February 1, 1873.

To THE EDITOR OF THE RAILROAD GAZETTE:

I have made use of the following formula during the location of about 200 miles of road, and can recommend it as the



most simple and expeditious mode known. For meaning of letters see figure.

$$\frac{R \pm D}{T} = \tan V$$

and

$$\frac{R \cos V}{T} = \sin V$$

$$A^\circ = V^\circ \approx V$$

When the tangent is shortened, D has the minus sign; when the tangent is lengthened (as dotted line in figure), the sign is plus. When D is $-$, any radius can be used; and when $+$, only the same can be used. When T and D are very small, use $\frac{T}{R \pm D}$ and $\frac{R \cos V}{R \pm D} = \tan V$ and $\sin V$, as before.

L. W.

Practical Field Engineering.

NO. XVII.

USEFUL RULES FOR LOCATING CURVES.

To find the distance that the middle point of a curve will fall inside the point of intersection of tangents is a problem that frequently arises to be solved on the field, especially on preliminary location. To take a simple example, suppose you have located your tangents so as to avoid a deep cutting through a hill, and you judge that a two-degree curve will fall very nearly on the most favorable ground; you can test the matter by a very simple calculation and measurement.

Let R = radius of your curve.

c = cosine of $\frac{1}{2}$ the central angle.

C = distance from the center of the circle of which your curve is an arc to the middle point of the chord of your curve, then

$$R \times c = C$$

(Formula No. 1)

Preserving the above notation, let S = the distance from the center of the circle to the point of intersection of tangents, and let x = the distance from the intersection of tangents to the middle point of your curve. Then

$$(No. 2) \frac{R^2}{U} = S, \text{ and}$$

$$(No. 3) S - R = X.$$

Now suppose that you find by your calculation that $X = 100$ feet, you have only to measure this distance from the point of intersection of tangents in the direction of radius, i. e., toward the center of the circle of which your curve is an arc. To get this direction accurately, subtract your angle of intersection from 180 deg. and divide the result by 2; quotient will be the number of degrees measuring the angle between radius prolonged and tangent at the point of intersection of tangents.

The above rules may be applied also to compound and reverse curves.

To change a point of compound curve so that the second curve will terminate in a tangent parallel to a given tangent—

Let x = distance between the tangents.

y = angle of the second curve (of the compound curve).

n = angle of the curve to be used instead of the second curve (of the compound curve).

R = larger radius.

r = smaller radius.

Then when the second curve has the smaller radius and the tangent to be touched falls within the curve, we have

$$\cos n = \frac{\cos y (R - r) + x}{(R - r)}$$

When the tangent to be touched falls without the curve, we have:

$$\cos n = \frac{\cos y (R - r) - x}{(R - r)}$$

When the second curve has the longer radius and the tangent to be touched falls within the curve, we have:

$$\cos n = \frac{\cos y (R - r) - x}{(R - r)}$$

If the tangent to be touched falls without the curve, we have:

$$\cos n = \frac{\cos y (R - r) + x}{(R - r)}$$

To find the middle ordinates of any given chord of an arc of a circle of any given radius—

Let R = radius of curve.

K = $\frac{1}{2}$ the given chord.

y = radius minus the middle ordinate.

z = middle ordinate.

Then

$$y = \sqrt{R^2 - K^2}$$

and

$$z = R - y$$

To find the deflection distance with a chord of 100 feet with any given radius of curvature.—Divide 10,000 by the radius in feet; quotient will be the deflection distance.

With any given chord and radius, to find the deflection distance.—Multiply twice the natural sine of one-half the deflection angle by the chord; product will be the deflection distance.

For all curves 10° and under, the tangential distance is equal to half the deflection distance.

For curves of more than 10°, to find the tangential distance.—Multiply twice the natural sine of half the tangential angle by the chord; product will be the tangential distance.

All the above rules should be committed to memory by the field engineer. They are of great value in locating curves, bending iron and setting out trestles on curves.

This paper is the last of this series. The author claims no originality as to the principles set forth, but hopes that, following his motto, "Nothing is too simple to be told, and nothing can be too simply told," he has been of service to the younger members and students of the engineering profession.

JAMES MAURICE THOMPSON, C. E., M. E.

Table of Diameters and Frog Circles for Round-Houses.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The following table explains itself, as far as its direct application; but some statement of the data is desirable. In annular locomotive houses, the common practice is to place the door-posts 13 feet from center to center, and in houses with covered tables, if the roof be supported by pillars, the distance between the centers of pillars must be at least 11 ft. 6 in., with these dimensions columns 3 and 4 have been computed. Columns 5 and 6 show the diameter of the circles where frogs (if any) would be placed. If this diameter is greater than the turn-tables, frogs must be used.

It will be sometimes economy to use a larger turn-table than really necessary to avoid the use of frogs; this can be seen easily. If the diameter of the frog circle is greater than twice the turn-table, double frogs will be necessary, and the diameter of their circle will be one-half of that given.

The external diameter of the house will be given by adding twice the breadth of the house back of the door or pillars to column 3, say 130 feet, or about 115 feet to column 4, if a covered table is used.

CHAS. A. SMITH.

TABLE OF INTERNAL DIAMETERS AND FROG CIRCLES FOR LOCOMOTIVE ROUND-HOUSES.

NUMBER OF STALLS.	Angle between tracks...	INTERNAL DIAMETER		DIAMETER OF FROG CIRCLE	
		Open Table, 13 ft. centers of Pillars	Covered Table, 11 ft. 6 in. centers of Pillars	Five ft. Gauge.	Four ft. 8 1/2 in. Gauge.....
1	2°	3	4	5	6
20	18°	83.10	73.51	31.96	30.11
21	15°	99.60	88.10	38.31	35.98
27	13° 20'	111.98	99.06	43.07	40.49
30	12°	124.36	110.00	47.83	41.96
32	11° 15'	132.63	117.33	51.01	47.95
36	10°	149.16	131.95	57.35	53.94
40	9°	165.69	146.57	61.73	59.90
44	8° 10'	182.23	161.35	70.09	65.87
48	7° 30'	198.77	175.83	76.45	71.89
50	7° 12'	207.04	183.15	79.63	74.86
52	6° 56'	215.30	190.46	82.81	77.97
56	6° 26'	221.86	215.11	89.18	83.89
61	6°	248.39	219.74	95.54	89.81
64	5° 38'	264.55	234.03	101.75	95.63
66	5° 28'	272.61	241.16	104.85	98.56
70	5° 8'	289.76	256.33	111.45	104.76
72	5°	298.03	261.64	114.63	107.75
75	4° 48'	310.44	274.62	119.40	112.24
80	4° 30'	321.13	292.85	127.36	119.71
90	4°	372.50	329.52	143.27	134.67

Train Dispatching.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A western-bound passenger train will wait at a meeting point 20 minutes behind its own card time, and then proceed, and running 20 minutes behind its own time and 20 minutes behind such eastward passenger train's time until such eastward-bound train is met and passed.

This rule for passenger trains is decidedly the best rule ever adopted upon any railroad, and has so been acknowledged by old and experienced officers of roads, and it is now used on a great many roads in this country. If our friend will look for a minute he will see it gives the eastward-bound train the right of road until it becomes 20 minutes behind its own time and 20 minutes behind such west-bound passenger train's time. I have dispatched trains constantly for 10 years under these rules, and they are decidedly the best rules ever worked on a road.

The eastward-bound train can run 20 minutes late, until it meets the western-bound train, which will not lose more than this much time in passing the east-bound train. Thereby both trains cannot possibly be over 20 minutes late, and can then make up this time. These rules are, of course, made to keep trains moving in case of interruption with the telegraph. I do not think my friend ever handled trains under this rule, or he would have quite a different opinion about it. The

Pennsylvania Railroad branches, including the Philadelphia & Erie road, have similar passenger rules, and they work with more satisfaction and less delay than any other rules ever tried by them.

The Massachusetts Commissioners' Report—Freight-Car Companies.

The following is the portion of the recent annual report of the Massachusetts Railroad Commissioners relating to freight lines on railroads, made in accordance with resolutions of the Legislature a year ago:

There are now practically three forms of ownership of the freight rolling stock in use on the railroad system of this country: (1) The ownership by individual railroad corporations; (2) the ownership by those corporations as parties to organizations consisting of several connecting roads; and (3) the ownership by private parties or companies, which derive a profit from the use of their cars by railroad corporations. The first form of ownership is the most common and does not need to be dwelt upon. The cars in this case are the property of the individual corporations, and are intended for use exclusively on their roads. When, however, they pass for any purpose over connecting roads, their use is paid for at certain understood rates, usually computed at so much per diem. This was the form of ownership which existed almost exclusively in the earlier and simpler days of railroad transportation, and is not liable to any abuse. As the system developed, however, and the lines of connection extended, this form of ownership failed to meet the requirements of the public. The delays, difficulties and inconvenience necessarily incident to it were the source of grave and well-founded complaints. Where goods were to be forwarded great distances, over a number of connecting roads, shippers and consignees found it almost impracticable to do business with many corporations at once, the responsibility of each of which ceased with the limits of its individual line. This fact gave a great impetus to the development of the several express and dispatch companies. These organizations, owned, themselves, no cars or rolling stock—they simply used that which the individual railroad corporations supplied, and paid for such use. This system speedily developed grave abuses. The profits of the express and dispatch companies were large, and the officials of the various railroads gradually became more or less pecuniarily interested in them. These parties were thus made subject to directly conflicting interests. It would have been difficult to devise any system which would have afforded better opportunity than this for the defrauding of railroad corporations by their employees. It would have inevitably resulted in the corporations doing the bulk of the work at the lowest possible rates, while the dispatch companies would have exacted from the public the largest profits. This obvious fact speedily attracted the attention of those managing certain leading through lines, and after some consideration of the best way of competing with the dispatch companies, at the same time securing the benefits of the arrangement to the companies, the colored lines—the Red, White and Blue lines—were organized.

It is on one of these competing through lines between New England and the West, that the system originally proposed and abandoned for the colored line system has in this part of the country found its fullest development. Observing the great success and popularity of the colored lines, those managing the competing route wished to organize a similar system for the roads under their control. When the object was discussed, the difficulty of want of means presented itself. The parties managing the Vermont Central road, which was the most important link in the chain, asserted that this company was in no condition to supply its quota of cars to an organization such as that suggested. It was therefore proposed that certain private parties, including the managers of the roads, should raise among themselves the necessary capital, and should supply the cars, to be owned by them, and run over the connecting roads at certain rates per mile. This scheme was carried out, and the National Car Company was formed; the cars being distinguished by the green color which they were painted. The company went into operation in 1868, owning then two hundred cars, equipped with patent adjustable axle to enable them to run over roads of different width of gauge. The allowance made for the use of these cars was at first 3 cents per mile run, whether full or empty. Subsequently, when the number of cars was increased, the allowance was reduced on the additional portion of them to 2.5 cents per mile; which amount, on a yet further addition of cars, was again reduced to 2 cents per mile. The business proved extremely profitable to those owning the cars, the number of which was rapidly increased from 200 in 1869 to 1,000 in 1872. In consequence, however, of the severe criticisms made upon it during the past autumn, in connection with the financial troubles of the Vermont Central road, the company has disposed of one-half of its cars to the Grand Trunk Railroad, and now runs only 500.

The success of this organization, however, and the pressing need felt of additional freight rolling stock on an insolvent road, induced the managers of the Vermont Central to organize another company in 1870, called the Vermont Iron & Car Company, which was intended to do local business over the Vermont Central and its connecting roads at mileage rates, in the same manner that the National Despatch did the through business. The cars of this company were of the ordinary construction, and the allowance made for their use was 2.5 cents per mile. The company began operations with 200 cars, which number was rapidly increased to about 700 in September, 1872. It is understood to have been extremely profitable to those concerned in it, which fact may indeed safely be inferred from the rapid increase of its property, as it is not supposed that the increase was wholly the result of new capital paid in by stockholders.

As regards therefore the specific points referred to in the chapter 65 of the Resolves of 1872, concerning which the Board was directed to report, it would appear—

1. "Whether cars owned by any persons or corporation, other than railroad corporations, are used in the transportation of merchandise over the railroads in this Commonwealth?"

The organizations known as the colored through freight lines, which have, to a very great degree, absorbed the business of through freights, are composed almost exclusively of railroad corporations which contribute each its quota of cars to the line. These organizations are wholly unobjectionable, and perform a most useful duty in the work of transportation, equally advantageous to the railroad corporations and the community. Two exceptions only are known to exist to the rule that the cars belonging to these lines are the property of the roads composing them. In one case a dispatch line, known as the Merchants' Dispatch, has been permitted by the combined roads to place a quota of cars in the line on the same footing as the railroad; its cars being used and paid for in the same manner as the cars of the several roads. In certain other cases—where weak or impoverished roads have been entitled to contribute a quota of cars, but have been unable or have not desired so to do, certain private persons have been authorized to contribute such quota in the name of the company. Such a proceeding is open to a certain amount of criticism, as it are all operations in which a corporation might have been profitably concerned, but which in reality have been turned over to its officials in their private capacity.

At the same time it should also be borne in mind that, though

it would be better for the corporation to furnish its quota of cars to the line itself, yet, failing so to do, it is better, for the public at least, and not improbably for itself, that the corporation should furnish them indirectly, rather than not belong to the line at all.

Besides these exceptional cases of cars of the colored lines owned by parties other than railroad corporations, it would appear that two distinct companies, known as the National Car Company and the Vermont Iron & Car Company, having no connection with the railroad corporations over whose lines their cars were intended to run, have also owned cars used in the transportation of merchandise over the roads of this State. These were both companies organized under the laws of Vermont, though in 1868 an act was passed by the Legislature of Massachusetts (chap. 205) under which the first was intended to be organized.

2. "By whom are such cars, not being the property of railroad corporations, owned?"

The National Car Company and the Vermont Iron & Car Company were composed largely of officials of the several roads, a number of whom were in the employ of the corporations of this State.

3. "Upon what terms are such cars, not the property of railroad companies, transported?"

The cars owned by the private companies or individuals interested in the colored lines are transported at the same rate—1.5 cents per mile—as those owned by the corporations properly composing the line. This rate is found remunerative, owing to the fact that on a majority of the railroads of the United States there is a deficiency of rolling stock; there are more corporations that hire cars than there are that let them, and freight rolling stock is thus made a commodity, as it were, of debtor and creditor corporations. Those roads, therefore, in the colored lines, which furnish their full quota or more of cars, earn a certain amount of money for the use of those cars from other roads which furnish less than their quota. As most of this business is for long distances—keeping wheels constantly in motion—the rate of 1.5 cents is found profitable; for short distances it would be otherwise. The distinction is important as touching the use of these cars in local business, so called, where they are kept standing for the delivery of freight or lying on sidings after a short haul. Railroad freight agents assert that they are glad, for through business or long hauls, to let cars at one cent per mile; while for local business, or short hauls, they are equally glad to hire them for two cents per mile. In other words, the through freighting business is more than twice as profitable for rolling stock as the local business. It is owing to this fact that the cars of the colored lines have proved a source of profit, while running at the low rate of 1.5 cents per mile.

4. "Whether any unjust or unequal discrimination or advantage is given, either in rates of freight or promptness of carriage, or in any other manner, to the owners of such cars by the railroad companies chartered in this Commonwealth?"

The colored lines were organized to accommodate through traffic, and whatever advantage as regards discrimination in rates of freight, etc., is given to them, must apparently accrue to the corporations, and in no wise affect the outside public. As regards the National Car Company and the Vermont Iron & Car Company, it has been alleged that, both within and without the Commonwealth, the result has followed which was naturally to be expected from the fact that the officers of roads had a direct pecuniary interest in the earnings of the cars of these companies. It has been asserted, and, the Commissioners are satisfied, not without grounds, that the cars of these companies, running at a fixed rate per mile, whether full, partially full or empty, have been kept in motion at rates for the carriage of goods which, at times, have caused the railroad to pay more for car service than the entire amounts they have received as freights. This has, in certain cases, been done almost habitually. In yet other cases, preference has been given to the cars of those private companies over the cars of the corporations—the last being kept standing on sidings, while all merchandise was reserved for the first. In none of these cases, however, can the Commissioners see how the outside community was made to suffer. Stockholders and railroad corporations were the victims, and were reduced, it may be, to bankruptcy; but the merchandise of the public was moved not only at no higher rates on that account, but at rates unduly depressed, as the mere fact of getting goods to move at any cost made the car companies earn mileage, though the corporations might earn no freights. The matter, therefore, concerned very closely the corporations, and especially, as the results have shown, those of Vermont; but not the community at large.

The remedy is in the hands of the holders of railroad securities, who can at any time they see fit prohibit their employees from being interested in these independent companies, or prohibit the running of the cars of such companies over their roads. If they do not see fit to do so, there would seem to be no good reason why the community at large should interfere in their behalf, thus cutting off in a considerable degree its own freighting facilities.

5. "Whether the officers of any such railroad corporation derive any pecuniary advantage from the running of such cars over railroads of which they have the management?"

It would seem, from what has been said, that a portion of the officers of the corporations connecting with the Vermont Central road do derive a pecuniary advantage from the running of such cars over the roads of which they have the management; and, undoubtedly, if the ownership of the stock of the car companies could be traced, it would be found that the employees of other corporations also were in a greater or less degree interested in them. The same may be said of the express companies and of the dispatch lines, nor indeed does the practice stop here, or find its worst exemplification in this class of enterprises. On the contrary, it is here more on the surface than almost anywhere else; more open to criticism and less subject to abuse. The officers of railroad corporations, as a rule, are not wealthy men, and they are subject to great temptations. They represent corporations in dealings with iron and coal mines, land companies, car and locomotive works, rolling mills, cattle-yards, rolling stock and express companies, and numberless other concerns, every one of which is anxious to secure their good will. There is, of course, no way of doing this so surely as by having them interested in the profits of the business. It is wholly impossible to trace an official into every investment he makes, and the only security of any value which a corporation can obtain lies in the high character and sufficient pay of its employees. If to these is added a direct interest on the part of the leading officials in the stock and securities of the corporation, they possess all the guarantees which it is possible for them to obtain, or for legislation to supply; with these, from the necessity of the case, railroad companies must always be peculiarly liable to suffer from every description of indirect dealing on the part of those in whose hands the care of their interests is confided.

In conclusion, their inquiries incline the Commissioners to believe that the particular antagonism of interest between corporations and officials, toward which their investigation was directed by the Resolve of 1872, exists in a very limited degree upon the railroads of Massachusetts; and, further, that where it does exist, its injurious effects, if any such there are, are limited to the corporations themselves, and are in no way directly felt by those doing business over their lines.

The Legislature of Maine has passed the general railroad law which was introduced at the beginning of the session.



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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial column our own opinions, and those only, and in our news column present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

STATE RAILROAD REPORTS.

We have received the annual reports of the Commissioners of Railroads of Maine (for 1872), Massachusetts (year ending with September, 1872), and Ohio and Illinois (year ending with June, 1872). The commissions in these States seem to have been established for different purposes—at least to have pursued different objects. Those of Maine are confined almost exclusively to the inspection of railroads as engineering structures, and the collection of information concerning accidents. The Massachusetts' reports, as our readers know, are careful, minute and profound investigations of the business of transportation as a whole, as well as of the various features on each road in the State, and of the relations of that business to the community. The current report is, like its predecessors, one of the few really valuable contributions to our limited railroad literature, and of so general interest that we shall try to find room for a large part of it in our columns hereafter. The report opens with a summary of the statistics of the roads of the State given in a few pages, chapters on "Street Railways" and "Accidents," in which latter three accidents are minutely reported on; on "The General Railroad Law," "The Use of the Steam Whistle," "Freight Car Companies," "Cheap Trains," "The Coal Supply," "Reductions of Freights and Fares," "Regulations of Fares and Freights by Law," and "Foreign Railroad Systems," with numerous valuable appendices, such as that on "Underbilling Grain," "Workman's Trains in connection with London Railways," on the effect of a reduction of freights on traffic, "Examination of Railroads," "Reports on Newly Constructed Railroads," "Effects of Cold on Iron and Steel," and tabulated statements, compiled from the company's reports, which are unapproached—in this country at least—for fullness and the real information they contain; and, further, "tabulated comparative results," which give at a glance information of the highest value which else could be had only by tedious calculations. The tables for each company give the amount of capital stock, funded and unfunded debt, cost of road and equipment and other property purchased, amounts of stock and debts and of income applied to construction, expenses of maintenance of way and buildings, traffic expenses, telegraph expenses, taxes (national, State and local), miscellaneous expenses; income from passengers, freight, express, rents, mails and miscellaneous; net income, interest, amount and percentage of dividends, surplus, mileage of

each class of trains, mileage of passengers carried, and of those to and from other roads, freight mileage and freight mileage to and from other roads, number of passengers carried and number coming from and going to other States and traveling within the State only, season-ticket passengers, passengers to and from Boston, season-ticket passengers to and from Boston, tonnage carried, tonnage from other States, tonnage to other States, tonnage within the State, tonnage from Boston and to it, length of main line, branches, proportion of length in Massachusetts, length of double track and of sidings, mileage of steel and of steel-top rails and of iron, miles of telegraph and number of offices in company's stations, number of bridges of 25-foot span and upwards, number of iron and of wooden bridges, of highway bridges 18 feet above track and of those lower, number of grade crossings, of overhead and under crossings, number of crossings with and without gates and flagmen, number of crossings of other railroads, at grade, over and under; number of locomotives and number equipped with train brakes, number of passenger cars and number with train brakes, number of mail and baggage and of freight cars, whole number of stockholders and number in Massachusetts, amount of stock held in Massachusetts, number of persons employed, number of persons killed or injured by causes beyond their own control, and number killed or injured by their own misconduct or carelessness.

This is a long list (and perhaps pretty dry reading), but it shows the minuteness of the reports and the skill with which they have been prepared.

But the "tabulated comparative results" (which we hope to find room for hereafter) will interest more the class of men engaged in working railroads, as they contain information of the utmost value in this service, and not to be found elsewhere with any completeness. These tables give, first, the amount *per mile* of stock, debt, cost of road, cost of equipment, gross income, cost of maintenance of way, traffic expenses, telegraph expenses, total expenses and net income, and give also the following very valuable account of earnings and expenses *per train mile*: earnings per passenger-train mile, per freight-train mile, gross income per train mile, net income per train mile, expenses per train mile of repairs of road, of bridges, of buildings, etc., of new rails and total cost per train mile of maintenance of road, cost per train mile of repairs of locomotives, of passenger and baggage cars, of freight cars, of employees in passenger department and freight department, of fuel, of oil and waste and total expenses per train mile; it gives also average fares per mile by season tickets, trip and passenger tickets, and to and from other roads, and average distance traveled; average receipts per ton per mile from local freight, freight to and from other roads, and average distance freight was carried; also average dead weight hauled per passenger and per ton of freight; average number of miles run by locomotives, by passenger cars and by freight cars; average number of passengers and of tons of freight carried per train mile, and average number of passengers and of tons of freight carried per each car, percentage of income to amount of stock and debt, of expense to income, and of net income to amount of stock and debt.

Any one who has frequent occasion to use railroad statistics will see the value of these tables. The earnings per train mile, for instance, are essential to any certain knowledge of the effect of any proposed increase or decrease of expenses per train mile. Looking at these tables we see that in Massachusetts passenger-train earnings per mile have varied from \$2.78 on the Hartford & New Haven, to 69 cents on the Boston, Barre & Gardner; that freight-train earnings have varied from \$4.09 on the New Bedford & Taunton to \$1.12 on the Boston, Barre & Gardner; and that the average of all the railroads has been \$1.67 per mile of passenger trains, \$1.88 per mile of freight trains, and \$1.84 per mile of all trains, and that the average net income per train mile was 50 cents. So the value of any anticipated economy may be calculated from the cost of each item per train mile. On the Boston & Albany, for instance, the cost of fuel was 20.8 cents per train mile, the total expenses being \$1.41. Any improvement in the construction of locomotives or in the manner of firing which should save one-tenth of the fuel would therefore effect a reduction of about 1½ per cent. in the total expenses; a saving of one-tenth in the wear of rails would be about eight-tenths of one per cent. of the expenses; a reduction of ten per cent. in wages in the passenger department would reduce total expenses a little more than 3½ per cent.; a similar reduction in the freight department would effect a reduction of 2½ per cent. in expenses. These are very slight indications of the many ways in which these figures may be used.

The Ohio report contains little more than the reports of the railroad companies, such as they have been for

many years past, and is not to be compared with the Massachusetts report. We have as yet, however, scarcely examined it with care enough to give an opinion on it.

The Illinois Commissioners have had the misfortune, since the organization of the Board, to be considered by the public chiefly as prosecutors of the railroad companies—a view which the laws hardly justify, and which makes it very difficult for them to perform well what should be their chief function—the collection and preparation of trustworthy information in an intelligible form, and the study of the relations of the corporations to the public. Their report, with appendices, etc., covers 450 pages. An abstract of the report proper we have published heretofore. The reports of the different companies are not so full or complete as could be desired, and are so presented as to make it a work of great difficulty to find anything in them; and the tabulated statistics are confined to stock and debts, length of line, cost of road and equipment, mileage of trains, earnings and expenses, gross earnings compared with expenses, tonnage carried, fuel consumed and accidents. Considering the great value of the statistics which might have been prepared (but only by a great deal of hard work in the Commissioners' office), and the comparative valuelessness of the reports and tables given, which for the most part yield information only after laborious calculations, which probably not one in a million of the people of Illinois will make, this is a serious fault. It is one, however, which we will hardly see remedied so long as a knowledge of railroad business is deemed a disqualification in a Commissioner, and "sympathy with the people" the sole necessary qualification. If we might be permitted to make a suggestion, we would say that any Commission, to be of any value to the people or the railroad companies (as it should be to both), should have a knowledge of the business of transportation, peculiar ability in making statistical investigations, and a disposition to get at the facts, without any such "sympathy" as will prevent its seeing the truth when it appears, or telling it when it has found it.

ROLLING STOCK COMPANIES.

We give elsewhere an abstract of the report of the United States Rolling Stock Company for the year 1872, with several additions which we have compiled from the figures of the report to make clearer some features of the company's business. Among these are the yearly rentals of the locomotives and the different kinds of cars owned by the company, by which it appears that the yearly rentals paid by the different companies (except in one instance, when they were higher) have been:

For locomotives	\$2,400
For passenger coaches	1,200
For baggage cars	450
For freight cars of all kinds	225

The company was organized primarily to provide rolling stock for the Atlantic & Great Western Railroad, and its chief officers and promoters are men largely interested in that road. The railroad company made a contract with the rolling stock company on the organization of the latter, by which it is to share in all profits over 12 per cent. of the rolling stock company. But the latter has had of late months several other customers, as its report shows.

The rentals at first sight seem very high, as in the case of locomotives they are about 22 per cent. of their cash cost, and in the case of freight cars probably 25 or 30 per cent. It also seems strange that the same rental should be received for first and second-class coaches, and the same for all classes of freight cars—as much for a flat as a box car, etc.

We may, perhaps, learn better the effect of such rentals on a company's expenses if we calculate what they would amount to if they were paid for the whole equipment used by any given company.

The Erie Railway, according to the last report published (to September 30, 1871—the last year of the Gould-Fisk administration), had the following rolling stock, on which the annual rentals, on the United States Rolling Stock Company's terms, would have been:

475 locomotives @ \$2,400	\$1,140,000
283 first and second-class coaches @ \$1,200	339,600
293 baggage and caboose cars @ \$150	181,850
9,644 freight cars @ \$225	1,084,950

Total rental of rolling stock

This is a sum equivalent to interest at 8 per cent. on \$33,705,000 for the use of rolling stock and the depreciation which cannot be made good by repairs. The cost of this rolling stock is reported at \$9,860,437.49.

The New York Central & Hudson River, with the equipment reported September 30, 1872, would have paid as rentals:

For 447 locomotives	\$1,072,800
For 891 passenger cars	385,200
For 155 baggage cars, etc.	71,100
For 10,983 freight cars	2,471,175

Total

Which is very nearly equal to the company's expenditure

for maintenance and renewal of rolling stock, and equivalent to 8 per cent. interest on a little more than \$50,000,000, the company's accounts giving \$13,413,636.78 as the actual cost of its equipment.

Take a Western railroad—the Illinois Central, for example. Its rentals would be, with the rolling stock reported at the end of 1871:

198 locomotives.....	\$463,200
108 passenger cars.....	189,600
45 baggage cars, etc.....	20,250
4,819 freight cars.....	971,775
Total.....	\$1,584,825

This is 8 per cent. interest on \$19,810,312.50, one-half more than the cost of maintenance and repairs of rolling stock for that year, and about three-fifths of the entire cost of road and equipment.

The price paid is supposed to be for rental solely, and not for maintenance and repairs, as the terms of the lease require that the rolling stock should be returned unimpaired in value and condition. This requirement, however, is practically impossible, as there must be a great deal of wear which cannot be made good at the end of a year, or two, or three—as of driving-wheel tires, and, indeed, most wearing parts, which may be in perfect condition after a year's use, but cannot have so much life in them as before they were used. If these requirements are interpreted to mean only such repairs and renewals as may be needed to keep the cars and locomotives in prime working condition, then the lessor should set aside from its rentals a fund for maintenance; as though the rolling stock may never absolutely wear out on the company's hands, still it must greatly depreciate in value with age and use, as would doubtless be proved if the company's property should now be offered for sale after less than a year's use.

The rates, again, are not so high as they may appear, except, perhaps, for the Atlantic & Great Western Company, whose lease is for seven years, because the rentals for the most part have been for the first year of the rolling stock, when it has its maximum strength and requires the fewest repairs and scarcely any renewals of parts worn out. Doubtless railroad companies will not pay as high rentals for cars a few years old as for new ones, as every year of age increases the probabilities of destruction; as every year of a man's age lessens his expectation of life.

If the rolling stock could be returned actually unimpaired in value, the business would be an extremely profitable one, as locomotives, such as are sold for \$10,500 or \$11,000 cash, return a rental of \$2,400 yearly, or something like 22 per cent. This is much better on the long leases, of course, than on the short ones, not only because of the gradual depreciation of the rolling stock, but because of the constant employment which is thus assured. With such property it is important that it be kept in use as constantly as possible, as the keeping of it for a lengthened period after its return by one lessee and before renting it to another involves some charges for care as well as the loss of rental, and the former would be quite troublesome, as the rolling-stock company cannot well have sheds and sidings in different parts of the country, and, if it should remove its property to central depots, would have to expend considerable sums for transportation.

If we take from the rentals, however, a sinking fund sufficient to renew the rolling stock after an average of ten years' service (which would require the investment of about 7 per cent. of the cost each year), we have in the case of locomotives say \$770 as a part of the rental to be saved for this purpose, leaving \$1,630 as the earnings of the investment, which, if the engine is constantly rented, will be about 15 per cent. on the cost. With this provision the company's property could be kept in the same average condition. This is a very pretty profit, it is true, but the fact that it will hardly be possible to obtain such rentals on rolling stock of average age must be taken into consideration, besides the further fact that doubtless there will be times when part of the rolling stock will not be rented.

Although the rentals charged may seem high, the paying of them does not necessarily indicate bad economy on the part of the lessees. When a company is offered a business at profitable rates in excess of the capacity of its rolling stock, it can make a profit while paying enormous rentals for cars and locomotives. It is as if a farmer had buildings, fences and plowed land beyond the capacity of his horses and plows to cultivate. The addition of a single team might enable him to make two or three times its cost in a single season. Of course the prudent farmer (and company) provides as far as possible for all the work he may have to do a sufficient equipment at the lowest market prices, but unforeseen emergencies sometimes occur when a car could earn its cost in six months, if it could be had on the moment, and then a company may make a good bargain when paying 20 or 25 per cent. for the use of rolling stock. Doubtless a corporation which makes a business of leasing such stock

has a legitimate place and may answer a useful purpose, by providing cars and engines for companies and individuals whose business may have grown too fast for them, and for those seasons of exceptional activity for which it is unprofitable for the railroad companies to provide equipment, because of their short duration. These irregularities in traffic are, however, largely provided for by the loaning of cars by one company to another, which is quite freely done; but doubtless a company which owns cars and no railroad will long be able to lease at good prices, a great deal of rolling stock.

Bridge Letting.

Last summer (August 3) we published some memoranda and comments on the tenders made for the construction of an iron bridge in the city of Elmira, New York. The contract for this bridge was ultimately let to the Bristol Iron Works, of Owego. How much of the work has been done we are not informed, but we learn that the Commissioners concluded that either it could not or would not fulfill the contract, and therefore took it out of its hands and afterward employed an engineer to draw up plans and specifications for a bridge for the locality. The specifications are now before us, and are admirably clear and explicit. The drawings, we have been told, are equally so, and the design very good. On these specification tenders were invited and the following bids were received:

	Per linear foot.
Baltimore Bridge Company.....	\$104.40
S. B. White & Sons, New Brighton, Pa.....	79.00
Watson Manufacturing Company, Paterson, N. J.....	78.62
Charles Macdonald, New York.....	78.00
C. P. Skinner.....	75.00
Pierre Soule.....	74.00
Shippen & Co., Coshocton, Ohio.....	70.44

The bridge was let before to the Bristol Iron Company for \$63,750, which, estimating the masonry at \$18,000, would amount to \$57.18 per foot. It will thus be seen that their calculations at that time were very wild, or else bridges have "gone up" since then.

We are inclined to believe, however, that parties who want to have bridges built must pay more for a structure of a given character, if they insist upon having it of a certain specific design than if they accept one of the patterns which are built by any of the reputable establishments. If a firm is obliged to conform to the patterns and methods of construction specified, the work costs more than if they can use their own way of doing similar work, to which their men are accustomed and their tools adapted. If the contract is advertised to be let to the lowest bidder irrespective of the design, irresponsible charlatans will of course underbid parties who do good work. On the other hand, if full and detailed plans are prepared, and contractors are obliged to build the structure as specified, then it prevents them from employing the methods and facilities which they are able to command to reduce the cost of similar work. A better plan, therefore, would seem to be that to which we have already called attention, that is, for the commissioners to employ in the first place an engineer to make some general specifications, giving the length, width and number of spans, load to be carried, factor of safety, character of bridge, nature of foundations, depth of water, and amount of masonry required, etc., and then ask for plans of bridges to fulfill those requirements. If that was done, probably some of the plans submitted would come from what are called "tin-pans" engineers and would be condemned at once. There would then remain a number of other plans from, say, A, B, C, D, E and F, any one of which would probably be as good as any other. If now A, B, C, D, E, and F were asked for bids for the construction of bridges on their respective plans, and the bid was accepted, it would give these parties an opportunity to employ the methods which they have used and perfected, to reduce the cost of such structures, whereas if they are obliged to build according to another engineer's designs, the cost of the structures will be greater, for the reasons already explained. A competent and honest engineer should in all cases be employed and retained to inspect the work as it progresses, so as to protect the interests of those who employ him, as persons who are ignorant of the science and art of bridge-building are quite incapable of knowing whether the work is done as it should be or not.

Sunday Train Service.

The Brotherhood of Locomotive Engineers, through its officers, has been laboring to secure the reduction, and as far as possible the abolition, of the running of trains on Sunday. There can be no doubt of the desirability of such a change; for we hardly think that any men, of any religion or no religion, believe that men do not need one day out of seven for their social well-being and physical health, to say nothing of their souls' health. Train men see little enough of home at the best, and if they could be sure, or reasonably sure, of their Sundays at home, they would be much the happier, and doubtless much the better for it; and doubtless, too, clearer of sight, steadier of nerve and more alert of mind. But in this, as in so many other desirable reforms, especially on railroads, custom and certain supposed necessities have established habits which are not easily changed. For instance, the trunk lines between the East and the West have been for months crowded with business, more than could be carried by running trains seven days in the week, and the complaint is great of insufficient facilities. To stop running Sundays would of course considerably decrease the carrying capacity of the road, and cause great complaints, and doubtless much inconvenience and loss, among shippers. Still this is not irremediable. Provision may be made of rolling stock, etc., such as will accommodate the traffic by running six days of the week.

A further and a formidable obstacle to a reform is the intimate connection of one railroad with many others. The line

which has trains arriving seven days in the week is not well accommodated by an outlet which carries its through cars away but six days in the week, especially if the former is short of rolling stock—a chronic condition of a great many roads. To work well, the reform should be general; and we all know how difficult it is to make any change universal and instantaneous. One which can begin in a corner and grow is comparatively easy; but when you have a nation to convert and convert and set to living a new life all at once, you need a little supernatural aid. The officers of the organization of which we speak have recognized this difficulty, and the petition which they have been circulating calls for a convention of representatives of railroad companies to devise "ways to abolish Sunday work on railroads, so far as it may seem practicable, after fully considering the whole subject."

This would seem a proper subject for the "Railway Association of America" to discuss and determine. Doubtless many companies will be loth to provide an equipment sufficient to do their work in six-sevenths of the days of the year; but it is not easy to see why they should not do so, just as much as ordinary manufacturers provide machinery to do all their work without working Sundays. It may cost more; but no one has a right to require or desire rates to be fixed so low as to make it necessary to conduct a business seven days in the week in order to make it pay.

There are, doubtless, some other obstacles to such a cessation of running trains Sunday which are not easily disposed of. A day's delay, with certain kinds of freights, may be disastrous; and more than half the freight trains would be compelled to lay up a day in making a journey of a thousand miles, if they did not run Sunday. But the effort now made is to reduce Sunday train service to the minimum, and not utterly to abolish it.

The Master Car Builders' Association.

Monthly meetings of this Association are now held in its rooms, No. 111 Liberty street, New York, on the afternoon of the third Thursday of each month. An opportunity is there offered to inventors, manufacturers and others, to exhibit their inventions and wares, and explain their nature and operation. In conformity with this arrangement, an interesting meeting was held on the 20th of February, when about thirty car builders and a number of their friends were present. A gentleman who represented the Doty & Miltimore car axle was present, and exhibited a model and explained its merits and advantages. Mr. Cross, of the firm of Cross & Bastine, of No. 122 West Broadway, New York, exhibited his method of graining wood, which was very interesting. By it the grain of any piece of wood is copied accurately from the wood itself. This is done by first covering the surface of board with the color to be used. This is then scraped off with a piece of leather, which leaves the pores of the wood filled with paint. A roller composed of an elastic substance resembling that used in the ink rollers of a printing-press is then passed over the board, and, being soft and elastic, presses into the pores of the wood, and receives an impression from the ink contained therein. The roller is then passed over the board to be grained, and conveys the impression received from the first board to the one to be grained. This process, of course, gives an exact *fac-simile* of the natural grain of the wood, and is done more quickly and with less expense than by any other method in use.

A representative of the American Friction Clutch Company, of Middletown, Conn., exhibited a model of his invention, in which the clutch was applied to a car axle, to be used as a brake. The clutch for many purposes appears to be one of the best we have seen, but it seems doubtful whether the use of it for a car brake would be successful or economical. With ordinary brakes there is no difficulty in locking the wheels of a car, and when or before that point is reached, the maximum power is applied that can be employed to retard a train.

The meeting was the third one thus far held in the rooms of the Association, and gave a fair promise of interest in the future. Neat cards of invitation were circulated among members and others, which brought together a larger number of attendants than were present at the previous meeting. It would, we think, add to the interest of these gatherings if some subject of general interest to the members was selected for discussion, and if information gathered from all available sources and bearing upon it was presented at the same time for discussion.

Record of New Railroad Construction.

This last number of the RAILROAD GAZETTE gave information of tracklaying on new roads, as follows:

Buffalo & Jamestown.—Extended southwestward 6 miles to a point 12 miles from Buffalo. *Baltimore & Ohio-Metropolitan Branch.*—The track has been laid on the gap of 13 miles, completing the road. *Hamilton & Lake Erie.*—Completed from Hamilton southwestward 11 miles to Caledonia. Ont.

This is a total of 30 miles of new railroad.

The current number has information of the following:

Southwest Pennsylvania.—Extended from its junction with the Pennsylvania Railroad at Greensburg, 31 miles east of Pittsburgh, south 12 miles to Tarr's. *Missisquoi & Clyde Rivers.*—Completed between Richford and Newport, Vt., by an extension of ten miles. *Memphis, Carthage & Northwestern.*—Extended from Carthage westward 10 miles to Minerville, Mo. *Canada Southern.*—Completed by the laying of 60 miles of track east of St. Thomas, Ont., since our last announcement, and 10 on the St. Clair Branch. *Great Western of Canada-Air Line Division.*—Completed and opened for business from Glencoe eastward to Welland Junction, Ont., 130 miles. *Louisiana & Texas.*—A branch has been completed from Terre

Bonne (55 miles west of New Orleans) southwest 15 miles to Houma, La.

This is a total of 247½ miles of new railroad—200 miles of it in Canada.

The Red Bank Accident.

An officer of the Bedford Division of the Pennsylvania Railroad writes to us concerning a notice of a collision at Red Bank, Pa., which was reported in our "Train Accidents in January" as having occurred "on the Bedford Division of the Pennsylvania Railroad." Our correspondent writes: "In some manner you have been wrongly informed, as the above is erroneous in every particular. First, there is no such station as Red Bank on the Bedford Division of the Pennsylvania Railroad; second, there has never been a collision between trains of any kind on the Bedford Division since it was first put in operation; and, lastly, there was neither engine nor cars off the track January 7."

We don't know that the case can be made any clearer for the Bedford Division; but nevertheless shall offer additional testimony: the accident at Red Bank was on the Northern Central Railway near Harrisburg, and by an error, which we confess and deplore, was credited to the Bedford Division of the Pennsylvania Railroad, which, we can very well understand, prefers not to take any credit of this kind due properly to other lines.

THE CLEVELAND, COLUMBUS, CINCINNATI & INDIANAPOLIS COMPANY, according to current reports, has broken its arrangement for an interchange of traffic with the Lake Shore & Michigan Southern, and formed a connection with the Atlantic & Great Western. The line is an important one, forming a leading line between Cleveland and Cincinnati, and the largest part of one between Cleveland and St. Louis, and having a productive local traffic from the many flourishing towns on its line. It is, however, hardly a complement of the Atlantic & Great Western, but rather a parallel route. Both have lines from Cleveland to Cincinnati, and the only part of the Cleveland road which would serve as an extension of the Atlantic & Great Western is the line from Marion, O., to Indianapolis, 182 miles, over which its St. Louis business is carried. The value of such an arrangement would be much greater to the Erie than to the Atlantic & Great Western, as the latter would carry over 413 miles, and the former—for most of the traffic—only 213 miles on the route to and from New York. The shortest route to be made of the lines between New York and St. Louis would be 1,160 miles long. Of course, little could be done with it until the gauge of the Erie and the Atlantic & Great Western is narrowed, even if the rumor, whose origin makes it suspicious, should prove true. The Lake Shore has a haul of 183 miles now on "Bee Line" traffic—about one-third of the length of its main line. There has been a sort of triple combination between these two and the Baltimore & Ohio, and the new Lake Shore & Tuscarawas Valley road has also had some relations with the "Bee Line" and the Lake Shore & Michigan Southern. It would seem more than usually difficult and disadvantageous to change relations under such circumstances, and it is quite probable that the new arrangement means nothing more than a provision for giving the Erie and Atlantic & Great Western facilities for doing a St. Louis business, and perhaps making their route to Cincinnati over this road, without any change in its relations to other companies.

THE STEAM CANAL-BOAT COMMISSION, which was authorized to award a premium of \$100,000 for a canal boat moved by steam, such as should fully satisfy the Commissioners "that the invention or device will lessen the cost of canal transportation and increase the capacity of the canals," has now reported, and it finds that none of the inventions tried justifies making the award, the boats making the best records having finished the required trial trips only near the close of navigation, leaving no time for such further tests as were deemed indispensable to prove the entire practicability and economy of the several inventions. The Commissioners, therefore, recommend that the investigations be continued and the reward offered for another year. During the coming season the boats which made trips last fall could be very thoroughly tried, and only a prolonged test will be at all conclusive.

THE ILLINOIS FREIGHT LAW has been declared unconstitutional by a unanimous decision of the Supreme Court of the State, in the famous case in which decision was made against the Chicago & Alton Company by the McLean County Circuit Court. The Court holds, as nearly as we can learn from the brief telegram announcing the decision, that the Legislature may prohibit unjust discriminations in charges, but that this law prohibits all discriminations, and does not permit the railroad companies to explain the reason of the discrimination.

NEW PUBLICATIONS.

American Railroad Manual.—This is to be the title of a new manual of statistics concerning the railroads of the United States and Canada, to be published by the "American Railroad Manual Company," and edited by Mr. Edward Vernon, for four years past editor of the *Official Railway Guide* and previously General Ticket Agent of the St. Louis, Alton & Terre Haute Railroad.

We have had until recently no such manual of railroad statistics, except such as were issued chiefly for advertising the business of the publishers, were given away for the most part, and were what might be expected of publications issued in such a way—fair to look upon, perhaps, but inside full of misinformation, errors in names and figures, and blunders of various kinds—besides being woefully incomplete. *Poor's Manual* was an immense improvement. The publishers have expended considerable money on it and have made their customers pay for the book; have evidently made honest efforts to render their statistics complete and accurate, and in these respects have succeeded so well and have made their book so infinitely better than anything preceding it that we have always felt very grate-

ful to them, and the work has become the only trusted authority of the kind.

It is, however, by no means perfect. It is, indeed, extremely difficult to make it so, partly because much of the information desired is not given by the companies, and quite as much, perhaps, because the reports of the companies come dropping in every day in the year, and so if time is taken to compare and arrange them and make general statements, with its present arrangement, the book will be antiquated before it is bound.

We understand that Mr. Vernon has contrived plans by which he expects to be able to obviate these difficulties, or the most of them, while his company's prospectus announces some new features, such as an abstract of the history of each corporation, which, if carried out with anything like completeness, cannot fail to be of very great value. The railroads are to be arranged according to States, and a map of the railroad system of each State is to be given, besides a general railroad map of the United States and Canada.

We know by experience that much of this proposed work is extremely difficult; but this will only make it the more valuable when once done. Moreover, much of it will only have to be done once.

Mr. Vernon brings unusual qualifications for such a task. He demonstrated in successfully establishing and editing the *Official Railway Guide* habits of minute accuracy and a capacity for labor which was simply astonishing, and these qualifications, joined to others which are perhaps quite as valuable if not so rare, give us good promise that the programme adopted will be carried out just as far as practicable. We understand that there are associated with Mr. Vernon in the publishing company several railroad men and capitalists who give it an assured financial basis to begin with.

The result of this will be, doubtless, two manuals better than we have had heretofore.

The United States Rolling Stock Company.

Under date of January 15, the President of this company, Gen. George B. McClellan, issued a report to the shareholders, in which he announces the issue of the balance (\$2,500,000) of the capital stock of the company, making the total issue \$5,000,000. Up to the close of the year only one-fifth of the last \$2,500,000 had been paid in, the conditions of the subscription providing that it be paid by installments.

The property of the company at the close of 1872 was as follows:

22 locomotives.....	\$319,200 00
33 first-class coaches.....	176,567 13
15 second-class coaches.....	74,937 22
4 combination cars.....	17,315 13
23 baggage cars.....	51,240 25
2,733 freight cars.....	2,172,754 26

Total valuation..... \$2,809,913 99
The report gives the payments up to date for rolling stock as \$2,764,104.54.

The average valuation of locomotives is thus put at \$11,400 each; of first-class coaches, \$5,044.77; of second-class coaches, \$4,862.48; of combination cars, \$4,303.75; of baggage cars, \$2,227.84; of freight cars (including box, dump, flat, gondola, and oil-tank cars), \$794.42.

The income of the company for the year (no stock having been leased before February 1) was:

Interest.....	\$35,025 93
Rentals.....	262,379 82

Total..... \$297,405 25

The expenses, including those of organization, were..... \$51,851 71
Dividends (8½ per cent.) and expense of paying them..... \$11,573 88

Total..... \$263,425 59

All the rentals have been promptly paid except that due from the Cincinnati & Terre Haute Company, which owes \$10,680.73, for which suit has been brought.

Tables are given of the rolling stock rented to each customer, giving the number of each kind of cars, name of builders, time of delivery and lease, rental and term of lease.

The names of the customers, the quantity of each kind of rolling stock, and the rentals due from each one during the year were:

	Rental.
Atlantic & Great Western (15 locomotives, 23 first-class and 18 second-class coaches, 20 baggage, 8½ box, 100 dump, 670 gondola, 125 flat, 80 oil-tank and 232 stock cars).....	\$20,250 34
Pithole Valley (1 first-class coach and 1 baggage car).....	1,306 25
Pennsylvania Petroleum (50 oil-tank and 30 gondola cars).....	5,638 50
Harlem Extension (3 locomotives and 3 first-class coaches).....	5,380 00
Cincinnati & Terre Haute (4 locomotives, 6 first-class coaches, 2 baggage, 4 combination, 50 box and 155 gondola cars).....	10,680 75
Erie & Pacific Dispatch (200 box cars).....	8,628 00
Newark & Straitsville Coal & Iron Co. (111 gondolas).....	4,473 73
Logansport, Crawfordsville & Southwestern (3 locomotives, 2 first-class coaches and 1 baggage car).....	1,925 00
St. Louis & Southeastern (2 locomotives).....	1,024 00
Paris & Danville (1 first-class coach, 1 combination car and 31 gondolas).....	765 00
Erie (5 locomotives).....	624 00
W. P. Rend & Co., Chicago (107 box cars).....	1,674 75
Total.....	\$262,379 82

The leases to the Atlantic & Great Western are all for seven years, those to the Pithole Valley and Pennsylvania Petroleum for one year, that to the Harlem Extension for five years; the stock leased to the Cincinnati & Terre Haute was withdrawn November 1 for non-payment of rental; the leases to the Erie & Pacific Dispatch, the Newark & Straitsville Coal & Iron Co., and the Logansport, Crawfordsville & Southwestern, are for one year; to the St. Louis & Southeastern and W. P. Rend & Co. for six months; to the Paris & Danville for two years, and to the Erie until June 1, 1873, beginning at various dates from November 12 to December 29.

The rentals reported are for various periods, so that a little calculation is necessary to ascertain the yearly rate of rental.

Making these calculations, however, we find that to the Atlantic & Great Western Company (which has a share in the profits above 12 per cent.) the locomotives are rented for

\$2,400, the first-class coaches for \$1,200, the second-class coaches for \$1,200, the baggage cars for \$450, and the box, gondola, dump, flat, oil tank and stock cars for \$225 each per year, the lease being for seven years, and the terms requiring that the lessee shall keep the rolling stock in perfect condition, "so that there shall be no deterioration in value or condition," during the lease, and also to pay insurance on it for the benefit of the lessor.

The rentals to other parties, all for comparatively short periods, are nearly all on the same terms; but the Cincinnati & Terre Haute is charged at the rate of \$570 per year for baggage cars and \$3,000 per year for locomotives—perhaps because of bad credit.

The report makes the following statement of the rolling stock ordered and under construction at the close of the year, and its "approximate cost." We add to it the cost of each of the vehicles according to the estimates of the totals:

	Aggregate Cost of cost.	Cost of each.
903 box cars.....	\$312,700	\$300
25 coal cars.....	10,625	425
60 gondola cars.....	44,000	733
227 stock cars.....	204,300	900
16 first class coaches.....	88,000	5,500
76 locomotives.....	1,064,000	14,000
Total.....	\$2,223,625	

Of these, 99 box cars, 50 stock cars, 4 coaches and 2 locomotives had been delivered to the company since the close of 1872 and before January 15, the date of the report.

Forms of contract and receipt accompany the report, the latter authorizing the lessor to take possession of and remove any rolling stock on which the monthly rental has been due more than fifteen days.

The officers of the United States Rolling Stock Company are: General George B. McClellan, President; James B. Hodgskin, Treasurer; Charles Day, Secretary; A. Hegewisch, Assistant Secretary; Isaac D. Barton, Superintendent; Bischoffsheim & Goldschmidt, London agents; General George B. McClellan, W. Butler Duncan, S. L. M. Barlow, Lawrence Wells, James B. Hodgskin, Board of Trustees. The office is at Nos. 74 and 76 Wall street, New York.

The Master Mechanics' Association.

The Committee on Resistance of Trains Due to Curves, etc., has issued the following circular:

The undersigned having been appointed by the American Railway Master Mechanics' Association, at their Convention held at Boston, in June last, a Committee on "The Resistance of Trains on Straight and Curved Tracks, and on Wide and Narrow-Gauge Roads, and of Four or Six-Wheel Trucks, and with Long and Short Wheel-Bases," respectfully invite your attention to the subject, and solicit your views and opinions on the same in the shape of as full answers as possible to the following questions:

1. How many passenger train cars (including sleepers, coach, baggage and post office) are employed on your road with four wheel trucks, and how many with six-wheel? Give also length of total wheel base of each class.

2. How many freight train cars are employed on your road with four-wheel trucks, and how many with six-wheel? Give also length of total wheel base of each.

3. From the experience obtained on your road, which description of truck produces the most resistance or friction, and, as a consequence, absorbs the most hauling power, those with four wheels or those with six wheels, both carrying the same weight of car?

4. State your experience in regard to the effect of long and short wheel-bases. In answering this, supposing it granted that the long wheel-base gives the steeper motion under high speeds, how far is this advantage neutralized by its greater friction in passing round sharp curves and switches? In conclusion of your answer to this question give your opinion as to length of wheel-base that would best meet all requirements and give least train resistance for both passenger and freight cars on 4ft. 8½in. track and on 3ft. track.

5. What is the dynamic force, or resistance, in pounds, per ton hauled of passenger trains on your road, running at a speed of 30 miles per hour on a level track with 4-wheel trucks?

6. Give the same information with 6-wheel trucks.

7. Give the same information, in pounds, per ton hauled of freight trains, at a speed of 15 miles per hour on a level track with 4-wheel trucks.

8. The information in Questions 5, 6 and 7 be obtained by the help of a "dynamometer," please so state, and give the maker's name of the instrument used.

W. A. ROBINSON, Great Western Railway,
WM. JACKSON,
Rome, Watertown & Ogdensburg Railroad,
C. T. HAM,
Late New York Central Railroad,

Please address your replies, not later than 1st of April, 1873, to W. A. Robinson, Mechanical Superintendent Great Western Railway, Hamilton, Ont., Canada.

American Locomotives in Russia.

We are permitted to publish the following extract from a personal letter from Hon. Henry D. Moore (formerly member of Congress from Philadelphia, and now residing in St. Petersburg), relative to the performance of the anthracite coal-burning locomotives sent to Russia last year by the Baldwin Locomotive Works:

ST. PETERSBURG, Nov. 30 (Dec. 12, N. S.), 1872.
MY DEAR MR. BAIRD: On Saturday last I had the great pleasure of being one of the company at the trial of your locomotive on the Nicholas road, and I can assure you it was a proud day for us Americans, because it was a success from beginning to end.

We had a long train, either ten or twelve of the largest passenger cars; and she took them along with perfect ease at the rate of 60 verbs (about 40 miles) an hour, and this on an up grade.

The Russian gentlemen who were present were not only pleased, but delighted, and what seemed to gratify them so much was the splendid action of the machine in burning anthracite coal. This seemed to be to them one of the most gratifying features, and well it may be, because it solves for them a question of great importance at this time—the question of fuel. Wood is getting very scarce in some portions of this country, and the Emperor has received petitions from some localities asking him to forbid the use of wood any longer on the railroads; and hence the importance of this matter to them. I took advantage of an opportunity offered me to enlarge somewhat on this subject.

When we arrived at the end of our trip, about 90 verbs from St. Petersburg, we found that your agent, Mr. F. K. Hain, had a very excellent dinner ready for the guests, for which he deserved and received much praise, for the manner in which it

was got up. Of course there were many toasts offered and speeches made in Russian, German and English, and I was gratified to find that almost every Russian present understood our language. One of the Russian officers present, in a few very kind words of our country and the enterprise of its citizens, as manifested by the occasion, offered a sentiment—"To America and our American friends"—and I was called upon to reply to it, and this was the occasion which I took advantage of to impress upon them the importance to them and their country of what had occurred there that day in the introduction of the anthracite coal-burning locomotives on their roads. I showed them the folly of their country being dependent upon England (as they are now) for such an important article as coal, when they have it in such inexhaustible quantities in their own country, and that I was sure that the introduction of the coal-burning locomotives into that country was one of the first steps which would lead to the development of their coal fields, etc.; and I was gratified indeed with the intense interest they all manifested in what I was saying. I mention these facts only because I know they will be gratifying to you, and if you could have been present and heard the kind and complimentary words they said of you, you would have felt proud—as you would have had a right to feel—and I can assure you that as an American I felt proud of my country, that one of her citizens had done her so much honor abroad as you have by your works. I remain

Yours, very truly, HENRY D. MOORE.

General Railroad News.

PERSONAL.

—Mr. Thomas T. Firth has resigned his position as Treasurer of the Pennsylvania Railroad Company, on account of his increasing age and failing health. Mr. Firth was Secretary of the company from 1848 to 1855, and has been Treasurer since 1855. He will still remain in the employ of the company, being charged with the duty of superintending the sinking fund.

—Mr. George Clarke, who recently resigned his position as Train Dispatcher at Williamsport on the Eastern Division of the Philadelphia & Erie road to accept a similar position on the Pittsburgh, Cincinnati & St. Louis, was presented before leaving his old post with a handsome gold chain valued at \$80, by the engineers on his division.

—William B. Gage, Master Mechanic of the Rensselaer & Saratoga Railroad, died suddenly at Green Island February 24.

ELECTIONS AND APPOINTMENTS.

—At the annual meeting of the Bridgeton & Port Norris Railroad Company, held at Bridgeton, N. J., February 13, the old board of directors was re-elected, as follows: Yeoman M. Gillingham, Ebenezer Westcott; James H. Stevens, Camden, N. J.; Benj. F. Lee, Trenton, N. J.; Theophilus Trenchard, Bridgeton, N. J.; Clement J. Lee, Newport, N. J.; G. Shepard, Dividing Creek, N. J.; Thomas Hand, Port Norris, N. J.; Joseph C. Bullock, Philadelphia.

—The board of directors of the Indiana North & South Railroad Company has chosen the following officers: President, E. B. Thomas; Vice-President, Hon. S. F. Maxwell; Secretary, E. Cluser; Treasurer, A. D. Cotton.

—Mr. George M. Kissinger has been appointed Train Dispatcher at Williamsport, Pa., on the Eastern Division of the Philadelphia & Erie road, in place of G. Clarke, who has resigned to accept a similar position on the Pittsburgh, Cincinnati & St. Louis.

—Col. Franklin Fairbanks, of St. Johnsbury, Vt., has taken temporarily the position of Superintendent of the Vermont Division of the Portland & Ogdensburg Railroad, in place of C. F. Spanuid, who has accepted a position on the New London Northern road.

—At the annual meeting of the Naugatuck Railroad Company, at Bridgeport, Conn., recently, the following board of directors was chosen: W. D. Bishop, R. Tomlinson, E. F. Bishop, Bridgeport, Conn.; Green Kendrick, Waterbury, Conn.; J. G. Wetmore, Winsted, Conn.; R. M. Bassett, Derby, Conn.; N. A. Baldwin, Milford, Conn.; J. B. Robertson, New Haven, Conn.; A. L. Dennis, Newark, N. J. They subsequently chose E. F. Bishop, President; Horace Nichols, Secretary and Treasurer; George W. Beach, Superintendent. These are all re-elections.

—At the annual meeting of the Dubuque & Sioux City Railroad Company, held at Dubuque, Ia., the four directors whose terms had expired were unanimously re-elected for the ensuing two years, as follows: Lorenz Blackstone, J. Pierpont Morgan, Abram S. Hewitt and James A. Roosevelt.

—At the annual meeting of the Dubuque Southwestern Railroad Company, at Dubuque, Ia., the old board of directors was re-elected, as follows: J. P. Farley, Dubuque, Ia.; John Crerar, Chicago; S. A. Strong, D. Willis James and M. K. Jesup, New York.

—Colonel George A. Merrill has reassumed the position of Superintendent of the New London Northern Railroad, in place of G. T. Benedict, resigned.

—A circular from Mr. Thomas Allen, President of the two companies, dated at St. Louis, February 17, announces that Thomas McKissick is appointed General Superintendent of the St. Louis & Iron Mountain Railroad, and of the Cairo & Fulton Railroad, of Arkansas, and his orders will be respected accordingly. The latter road will remain temporarily in charge of James H. Morley, the Chief Engineer, until ready to be delivered over to the Operating Department, or until further notice.

—A circular from Mr. McKissick, of same date, announces that Mr. A. W. Soper is appointed Assistant General Superintendent, that the several heads of departments are continued in their present positions and authority, and that all orders and rules in force will remain in effect until further notice.

—Mr. Stephen D. Barlow, formerly President of the Iron Mountain Railroad Company, and afterward Comptroller of the city of St. Louis, is appointed "Assistant President and General Secretary, with enlarged powers."

—Mr. E. A. Parker, for many years General Western Passenger Agent of the Chicago, Burlington & Quincy Railroad, and in the service of that company most of his life since boyhood (and not a little of it during boyhood), has accepted an appointment as General Ticket Agent of the Hannibal & St. Joseph Railroad, beginning March 1. Mr. Perkins' entire railroad experience has been in the field which the Hannibal & St. Joseph occupies, and his qualifications are thus especially good for that line; and his knowledge of his business, energy and industry are such as would command him to any line.

—Mr. John Sibson has been appointed General Freight Agent of the Colorado Central Railroad. Mr. Sibson recently held the same position on the International Railroad of Texas.

—Mr. C. E. Hartwell, late Train Dispatcher of the Central Pacific at Sacramento, Cal., has been appointed Assistant Superintendent of the Virginia & Truckee Railroad.

—At the annual meeting of the Cleveland, Mt. Vernon & Delaware Railroad Company, at Mt. Vernon, O., February 18, the following board of directors was chosen: R. C. Hurd, Samuel Israel and Charles Cooper, Mt. Vernon, O.; Thomas D. Messler, Pittsburgh, Pa.; Isaac Haxteter, Millersburg, O.; and

William M. Orr, Orville, O.; Hon. R. C. Hurd was re-elected President. The directors are all re-elected.

—The officers of the Ohio & Baltimore Short Line Railroad Company, recently organized, are: C. M. Reed, Washington, Pa., President, and T. McKennan, W. W. Smith, W. Workman, S. B. Hays, of Washington, Pa.; T. H. Garret, W. Keyser, John K. Cowen, of Baltimore, directors.

—At the annual meeting of the Delaware, Lackawanna & Western Railroad Company, in New York, February 23, the following officers were elected: President, Samuel Slocum; Treasurer, Andrew J. Odell; Secretary, Frederick F. Chambers; Managers, William E. Dodge, Moses Taylor, Denning Duer, Wilson G. Hunt, Rufus R. Graves, S. B. Chittenden, Percy R. Pine, George Bliss, Henry A. Kent, New York City; John Brabin, James Blair, Scranton, Pa.; John I. Blair, Blairstown, N. J.; William Walter Phelps, Englewood, N. J.; and George Bulkley, Southport, Conn. The only change made is the substitution of Mr. Henry A. Kent for Joseph H. Scranton, deceased, on the board of managers.

—At the annual meeting of the Marietta & Cincinnati Railroad Company, at Cincinnati, February 19, the old board of directors was re-elected, as follows: John King, Jr., Johns Hopkins, Thomas Whitridge, A. C. Chapman and J. Donnell Smith, Baltimore; N. Wright, R. M. Bishop, W. W. Scarborough and J. D. Lehman, Cincinnati; W. T. McClintock and John Madeira, Chillicothe, O.; W. H. Oldham, Marietta, O.; and J. N. Camden, Parkersburg, W. Va. The board re-elected John King, Jr., President; W. H. Oldham, Treasurer, and C. F. Low, Secretary.

—The annual meeting of the Cincinnati & Baltimore Railroad Company was held at Cincinnati, February 19, and the old board of directors re-elected as follows: John King, Jr., John Donnell Smith, C. Oliver O'Donnell, Baltimore; W. W. Scarborough, Kenner Garrard, Cincinnati; W. H. Oldham, Marietta, O.; and W. T. McClintock, Chillicothe, O. The board re-elected W. T. McClintock, President; W. E. Jones, Treasurer, and C. F. Low, Secretary.

—Mr. George Lowe Reid, formerly Chief Engineer of the Great Western Railway of Canada, has been appointed Chief Engineer of the Canada Pacific Railway.

—The Memphis & Raleigh Railroad Company has elected the following officers: John Donovan, President; A. J. White, Treasurer and Secretary; J. M. Coleman, Enoch Taylor and L. P. Judd, directors.

TRAFFIC AND EARNINGS.

—The earnings of the Kansas Pacific Railway for the second week in February were: From passengers, \$17,950.80; freight, \$25,701.36; mails, \$2,055.31; total, \$45,707.47. Of this amount \$2,323.06 was for transportation of troops, mails and government freight.

—The earnings of the Louisville, Cincinnati & Lexington Railroad in January, an officer of the company informs us, were 99 per cent. more than for the same month last year.

—The earnings of the Erie Railway for the week ending February 15 were: 1873, \$110,631; 1872, \$377,433; increase, \$33,198, or 8½ per cent.

—The earnings of the St. Louis & Southern Railway for the second week in February were \$24,628.28. The earnings of the St. Louis Division for the week were: 1873, \$15,149.78; 1872, \$6,501.52; increase, \$8,618.26, or 133 per cent.

—The earnings of the Atlantic & Gulf Railroad for the year were: 1872, \$983,966.06; 1871, \$1,044,667.93; decrease, \$60,701.92, or 5½ per cent. The earnings for 1872 were at the rate of \$2,877 per mile. The decrease was mainly in the first quarter of the year.

—The earnings of the Belvidere Delaware and Flemington Railroads for the year 1872 were \$851,597.45. The expenses were \$649,175.39, or 76½ per cent. of earnings, and the net earnings were \$202,422.09. The gross earnings were at the rate of \$10,138 per mile.

—The earnings and expenses of the Memphis & Charleston Railroad for the six months ending December 31, 1872, were as follows:

Earnings.....	\$771,448.77
Expenses, including construction.....	482,847.75
Net earnings.....	\$282,601.02
Interest on first and second mortgage bonds.....	65,170.00
Balance.....	\$217,431.02

The gross earnings show an increase of \$32,263.56, or 7½ per cent., over the last six months of 1871, and the net earnings an increase of \$227,814.16, or 41½ per cent. The gross earnings were at the rate of \$2,580 per mile.

ANNUAL REPORTS.

Natchez, Jackson & Columbus.

The annual report for the year 1872 shows that the line of this road has been located from Natchez northeast 25½ miles to Fayette, the county seat of Jefferson County, Miss., and the road-bed completed for 12 miles out of Natchez, at an average cost of \$5,843.23 cents per mile. (The gauge is 3½ feet). To complete the road to Fayette and equip will cost, the Engineer estimates, \$276,200 more, making the cost of 25½ miles of road, with iron weighing 36 lbs. per yard, about \$346,000. Iron for three miles of road is on hand, and tracklaying has been begun, the company having one locomotive and cars for a construction train.

The company has received a subscription of \$500,000 from Adams County (in which Natchez is situated), and one of \$225,000 from Hinds County, the latter to be delivered when 25 miles of road is completed within the county. A subscription of \$250,000 from Jefferson County (between Adams and Hinds) was asked, but failed to receive the requisite two-thirds of the votes cast. It is hoped that this subscription will be authorized at a future election. Of the Adams County bonds, \$460,600 has been received. Of these \$117,600 has been sold, \$57,200 at 70 per cent. and the rest at 63 per cent. of their face. If the unsold bonds of Adams County can be sold for 65 or 66 per cent., the President says the road can be completed to Fayette. When it is completed so far, he believes that the first-mortgage bonds of the company will be salable and afford means for the extension of the road towards Columbus, Miss., which is about 180 miles northeast of Natchez.

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Mr. Will T. Martin is President, J. H. Fitzpatrick, Secretary; George W. Koontz, Treasurer, and S. M. Preston, Chief Engineer, all, we believe, of Natchez.

Eastern.

The Eastern Railroad extends from Boston northeast to the New Hampshire State line, 44 miles, and the company operates under lease the Eastern Railroad of New Hampshire, from the State line to Portsmouth, N. H., and the Portland, Saco & Portsmouth Railroad, its main line thus extending from Boston to Portland, Me., 108 miles. The company also operates the Lawrence Branch, from Salem to Lawrence; the Saugus Branch, from South Malden to Lynn; the Gloucester Branch, from Beverly to Rockport; the Amesbury Branch, from Salisbury to Amesbury; the Marblehead Branch, from Salem to Marblehead; the South Reading and Essex Branches, making a total of 74 miles of branch lines in Massachusetts; and the Portsmouth, Great Falls & Conway Railroad, from Conway Junction to North

Conway, N. H., 71 miles, and the Wolfboro Branch of the above road, 12½ miles long, in New Hampshire. The whole length of road operated is 285 miles. Six miles of the Portsmouth, Great Falls & Conway road, from Conway to North Conway, was opened early in June, the Wolfboro Branch was not opened until August, and the Essex Branch, from Wenham to Essex, five miles, was opened July 1. During the year the Newburyport City Railroad had been leased by the company.

The receipts and expenditures of the company for the year ending November 30, 1872, are given as follows:

Receipts from—	
Passengers.....	\$1,822,855 10
Freight.....	863,789 70
Express.....	65,875 31
Mail.....	24,936 40
Rentals.....	18,786 01
Extra baggage.....	1,581 27
Miscellaneous.....	29,848 07
Total.....	\$2,827,611 86

Expenditures for—	
Maintenance of way.....	\$494,175 10
Fuel.....	331,811 98
Locomotive power.....	315,233 80
Train expenses.....	435,463 55
Station expenses.....	286,090 47
Office expenses.....	106,445 41
Insurance and taxes.....	93,523 97
Total.....	\$3,004,746 28

Net earnings.....	\$822,895 58
Interest paid.....	\$354,593 93
Dividends on Portland, Saco & Portsmouth Railroad.....	150,000 00
Balance.....	\$318,301 65

The expenses were 70½ per cent. of the gross earnings, and the gross earnings were at the rate of \$11,243 per mile. The earnings of the New Hampshire lines, the business of which is comparatively light, reduce the general average considerably.

During the year 12½ miles of second track and 7½ miles of new sidings have been laid. In this new track and in repairs 3,308 tons iron and 1,170 tons steel rails were used. Of the main line 1½ miles are now laid with steel. New stations have been built at East Boston, Somerville, Lynn and Greenland, new engine-houses at Wenham and Portsmouth, and a new car-house at Boston. The bridge over Chelsea Creek and Squam River have been rebuilt and 52 miles of new fence built. During the year 15 new locomotives, 45 passenger, 8 baggage, 133 box and 75 platform cars have been added to the equipment. Plans have been prepared for the new passenger station in Boston.

New bonds to the amount of \$1,500,000 have been issued—\$1,000,000 in currency, bearing 7 per cent interest, and \$500,000 in sterling bonds, bearing 6 per cent. Nearly all the currency bonds have been sold, and the sterling bonds are in the hands of Baring Brothers & Co., of London, under a special agreement.

The experiment of running cheap morning and evening trains has been begun, but it is too soon to pronounce the system either a failure or success.

The damages caused by the Revere accident have been substantially settled. The total cost of this accident so far has been \$244,784.88. It has been thought best not to charge this to the expenses of the year, but to fund it, in part at least, and pay it off gradually.

Boston & Albany.

The Boston & Albany Railroad extends from Boston to Albany, N. Y., 201.63 miles, with branches from Brighton to East Boston, 9.30 miles, from Boston to Brookline, 1.55 miles, from West Newton to Newton Lower Falls, 1.10 miles, from Natick to Saxonville, 3.70 miles, from Framingham to Milford, 12 miles, from Grafton to Milbury, 3 miles, and from Chatham, N. Y., to Hudson, 17.33 miles. The Pittsfield & North Adams Railroad, 18.65 miles long, is also operated under lease, making a total of 268.28 miles of road operated. The road is the principal line from Boston to the West.

The operations of the road for the year ending September 30, 1872, are thus reported:

Receipts from passengers.....	\$2,860,883 85
From freight.....	5,846,768 11
From mails and other sources.....	531,946 85

Total earnings.....	\$9,259,599 81
Expenses for	
Repairs of roadway.....	\$1,458,315 22
Repairs of engines.....	601,605 04
Repairs of cars.....	995,000 00
Repairs of buildings, ferry, &c.....	237,531 28
Transportation expenses.....	3,487,060 74
General expenses.....	117,471 84
Total.....	\$6,896,984 13

Net earnings.....	\$2,362,614 69
Interest on loans and exchange.....	\$115,154 61
Dividends, 10 per cent. and tax on same.....	1,977,469 35

Dividends on Pittsfield & North Adams stock, 6 per cent.....

27,000 00

\$2,119,623 96

Surplus not divided.....

\$242,900 73

On insurance fund and \$8,883.89 exchange to Barings. 2,907,316 45

Total surplus.....

\$3,840,307 18

The expenses were 75½ per cent. of the gross receipts, and the gross receipts were at

tion of the Western and Boston & Worcester companies, the approaches to the Boston terminus have been improved, the freight accommodations nearly doubled, a large tract of Back Bay land purchased and about half filled in, the shops removed from Boston to Allston, and extensive additions made to the wharves and warehouses at East Boston. The yards at Albany have been much enlarged and new shops built there.

The capital stock and funded debt are now as follows:

Capital stock, 196,641 shares	\$19,664,100
Albany bonds	106,000
Dollar bonds	667,000
Seven per cent. bonds	2,364,000
Total funded debt	3,037,000
Total	\$22,701,100

This capital account is at the rate of \$84,706 per mile of road. The sinking fund now amounts to \$1,658,431.36, and the surplus or contingent fund to \$1,581,875.82. The total cost of road and equipment is given at \$24,301,751.46, or, including the cost to the company of the South Boston Flats and the Hudson River bridges, \$25,128,474.19.

Washington & Ohio.

This road extends from Alexandria, Va., northwest to Hamilton, 44 miles. The business for the year ending September 30, 1872, was as follows:

Gross earnings	\$31,285
Operating and current expenses	13,337
Net earnings	17,948

The passenger trains ran 53,585 miles and freight trains 27,776 miles, and transported 27,693 passengers and 19,418 tons of freight. The expenses were 904 per cent. of the earnings, and the earnings were at the rate of \$1,847 per mile. The equipment of the road consists of four locomotives, six passenger, three baggage, and 65 freight cars. The cost of the road and equipment is given at \$1,618,119.

The present amount of capital stock is \$900,700. The funded debt is \$130,000, of which \$82,000 bears 7 per cent. interest in gold and \$48,000 7 per cent. in currency. The currency bonds are shortly to be retired. The company is making great efforts to obtain funds for the western extension of its road.

Philadelphia & Erie.

The report of the manager of this company, presented at the recent annual meeting, gives the receipts and expenditures for the year 1872 as follows:

RECEIPTS FROM.	
Passengers	\$647,274
Freight	3,177,543
Mails and express	72,491
Miscellaneous sources	83,438
Total	\$3,980,751

EXPENDED FOR.	
Conducting transportation	\$30,942
Motive power	846,721
Maintenance of cars	333,168
Maintenance of way	1,286,184
	\$3,887,015

Net earnings

The gross earnings show an increase over the preceding year of \$138,489, or 12½ per cent. There was an increase in the number of passengers carried of 103,900, and in the freight traffic of 200,077 tons. The expenses were 82½ per cent. of the gross receipts, and the latter were at the rate of \$13,822 per mile. No dividends have been made during the year, partly on account of the expenses caused by the burning of the Linden Bridge and from the necessity of purchasing a large quantity of iron for track repairs and renewals. A considerable length of new sidings has been laid during the year, and important improvements of the track are now in progress. It is hoped that before long the whole line will be placed in first-class condition.

Fort Wayne, Jackson & Saginaw.

The earnings of this road, which extends from Jackson, Mich., to Fort Wayne, Ind., 100 miles, for the year 1872 were as follows:

From passengers	\$90,992.89
Freight	131,655.71
Use of track and haul of cars, Detroit, Eel River & Illinois Company	42,215.81
Mails, express and sundries	16,483.22
Total	\$280,647.83

The operating expenses were \$149,755.76, or 53½ per cent. of the earnings, leaving the net earnings, \$139,891.87. The gross earnings, which were at the rate of \$2,806 per mile, showed an increase of \$60,136.64, or 27½ per cent., over the preceding year.

The road has been nearly all ballasted during the year, and put in better condition than ever before. Two coaches and 50 flat cars have been added to the equipment.

West Jersey.

The annual report of this company shows that the receipts for the past year were \$664,777.44, and the expenditures, including operating expenses, rentals, taxes and interest on bonds, \$554,000.15, leaving a net balance of \$110,777.29, out of which two semi-annual dividends of 4 per cent. each, amounting in all to \$96,760, were paid, leaving a surplus of \$14,017.29. The earnings show an increase of \$38,967.48, or 6½ per cent. over the previous year. The number of passengers carried one mile was 17,518,537, being an increase of 1,966,863, or 12½ per cent. over the passenger mileage of the preceding year. The earnings were at the rate of \$5,235 per mile.

The main line from Philadelphia to Cape May is being relaid with steel rails as rapidly as possible. The passenger travel over this line in summer is very large, and trains are run at a considerable speed. A large and substantial building is to be erected in Camden during the coming season for the general offices of the company.

The road, with its leased lines, forms a main line from Camden, N. J., opposite Philadelphia, to Cape May, 80 miles, with a branch from Woodbury to Swedesboro, 11 miles; a branch from Glassboro to Bridgeton, 19 miles, and a branch of this latter line from Elmer to Salem, 17 miles, making 127 miles of road.

CHICAGO RAILROAD NEWS.

Chicago & Alton.

A telegram from Springfield, Ill., dated February 23, gives the decision of the Supreme Court of Illinois in the case of the Chicago & Alton Company. The case was tried on an appeal from the Circuit Court of McLean County. The Court is of the opinion that while the Legislature has an unquestionable power to prohibit unjust discrimination in railroad freights, no prosecution can be maintained under the existing act until amended, because it does not prohibit unjust discrimination merely but discrimination of any character, and because it does not allow the companies to explain the reasons of the discrimination but forfeits their franchise upon an arbitrary and conclusive presumption of guilt to be drawn from the proof of an act that might be shown to be perfectly innocent. In these particulars the existing act violates the spirit of the Constitution. The judgment of the Circuit Court ousting the appellant of its franchises must therefore be reversed.

The original suit was brought by the Railroad and Ware-

house Commissioners for forfeiture of the company's franchise on account of disregard of the laws regulating rates of freight.

Illinois Central.

The business of riding on the cars of this company for the purpose of testing the State railroad law is not so active as it was a few weeks ago. The company offers to take all large parties at excursion rates, and hereafter this will be the rule of the railroad officials, and two and seven-tenths cents per mile will be accepted as the regular fare for all members of excursion parties.

Chicago, Milwaukee & St. Paul.

Regular passenger trains commenced running on this road from Chicago to Milwaukee, on Sunday, February 16. The time table at present is as follows:

	Leave.	Arrive.
Milwaukee, St. Paul & Minneapolis day Express	9:00 a. m.	7:30 a. m.
Milwaukee & Prairie du Chien Mail and	4:30 p. m.	11:30 a. m.
Milwaukee, St. Paul & Minneapolis night	9:00 p. m.	6:00 p. m.

Lake Shore & Michigan Southern.

This company now has 80 miles of having a double track all the way from Chicago to Buffalo. During an unusually severe winter, the trains have run with a regularity equal at least to that of any other road, and been remarkably free from accidents. On the first day of January, 1873, the company owned 9,267 cars of all kinds, against 7,341 on the first of January 1872. During the year the company have paid for the manufacture and repair of cars alone the sum of \$2,000,000 in round numbers. There has been a loss of only 245 cars of all kinds during the year. Of the cars now on hand, 122 are first-class passenger coaches, 14 second-class, 2 pay cars, 23 emigrant, 13 postal and 56 baggage cars. Of the freight cars, 4,595 were box, 1,323 stock, 2,720 platform, 232 caboose, 148 dumpers, 8 derricks and 11 express freight cars.

Chicago, Danville & Vincennes.

Mr. John Young, the General Manager of this road, has recently returned from New York, where he has ordered ten "Mogul" engines, which are to be delivered here as soon as possible. The freight business of the road is very rapidly increasing in volume, and will need all of the several hundred freight cars which have recently been ordered. The Secretary of the Board of Trade, in his recent report, says that this company has delivered in Chicago, during the year 1872, over 200,000 tons of Indiana coal, much of which was of superior quality and eminently adapted to manufacturing or steam purposes. The company has experienced some trouble recently in the laying of its track in the city over Carpenter street to Curtis, and across this street to May to the line of the Columbus, Chicago & Indiana Central Company from interference by the Chicago city authorities. On February 13, the Vincennes, Petersburg & Owensboro Railroad Company was organized at Vincennes, Ind., to run from Vincennes south by east to the Ohio, opposite Owensboro, Ky., there to connect with the Owensboro & Russellville Railroad, now partly completed, which is intended to form a short route from Owensboro to Nashville. These two roads, if built, will thus with the Chicago, Danville & Vincennes, form a direct route from Chicago to Nashville and the Southeastern States. The officers of this road are L. L. Watson, President; C. Mallen, Vice-President; L. Noble, Secretary; H. A. Foulks, Treasurer.

Chicago & Northwestern.

This company has decided to commence immediately the construction of machine shops, car and locomotive works on the largest scale, just outside of the western city limits, or a little west of "Central Park." The company has bought 240 acres of land, extending from Kinzie street north half a mile to Chicago avenue, and westward from Crawford avenue. On this ground are to be constructed buildings as follows: A machine shop 80 by 300 feet in size, with two wings each, of which will be 80 by 240 feet in size, the latter to be used for the erecting shops; a blacksmith shop, 80 by 200 feet; a foundry, 100 by 200 feet in size; a storehouse, 50 by 300 feet; locomotive works, 120 by 550 feet; boiler shop, 100 by 140 feet; paint shop, 80 by 300 feet, and two stories in height. The company has nearly completed the track which is to connect the Galena Division with the Wisconsin Division near Irving Park. The buildings are to be begun and prosecuted to completion, if possible, during the year 1873.

THE SCRAP HEAP.

Premium for Boiler Steel.

Nature says that the Council of the Society of Arts (English) has resolved to offer the Society's gold medal to that manufacturer who shall produce and send to the London International Exhibition of 1873 the best specimens of steel, suitable for affording increased security in the construction of locomotives and marine engines and boilers, and for other engineering purposes.

Robbery of a Bonded Car.

A telegram from St. Louis, dated January 30, says: "A bonded car belonging to the Merchants' Dispatch Company, which reached here to-day from New York, was discovered to have been robbed of about \$1,300 worth of goods, gold value, consigned to Field Brothers, of this city. The car was robbed between New York and Albany, and it is supposed that the thief locked himself in the car at New York. This is the first robbery of goods shipped to any interior port of entry since the law providing for railroad transit of goods in bond went into effect."

Locomotive Boiler Explosions.

A correspondent in Quincy, Ill., writing under date of February 4, gives the following interesting account of a boiler explosion there: "Engine No. 21, belonging to the Chicago, Burlington & Quincy Railroad, used for switching in this yard, exploded at 6:50 a. m. She was what is commonly known as a 'tender-wheeler' of Manchester build; has been in use upward of 20 years, was originally a wood-burner, but was changed about 10 years ago to a coal-burner. She had a steel fire-box put in within the past three years; was considered reasonably safe and in good repair. The fireman was in the cab when the explosion occurred, but was not materially injured. One or two persons who were passing by at the time were struck by flying fragments, but escaped uninjured. The boiler gave way at the seam on the wagon-top, just forward of the dome, tearing the lower sheet in a line with the rivet-holes clear around to the fire-box. About midway of the cylinder part of the boiler the sheets were torn diagonally across. Between these two points the boiler is laid entirely open to the flames; some portion of it is gone, and the rest is lapped over the frame on each side. The dry-pipe was torn in two; a piece weighing about 80 pounds was thrown over the round-house, across the street into a door-yard, a distance of half a block in a direct line. A portion of the boiler weighing several hundred pounds and the sand-box were found about a block distant; smaller portions were found still farther off. The flues bow outward and downward, the outside rows cutting off at the fire-box and bending forward over the remaining portion of the boiler.

"The windows on the ground floors of adjacent buildings

facing the scene of disaster were crushed in, sash and all, by the force of the concussion; but windows facing the opposite direction in buildings not half as far off did not lose any glass. The engine had not been used for several days, had been filled with water by the hose, been fired up and run out upon a side-track and left there about 40 minutes previous to the explosion, with plenty of water and 40 pounds of steam. She had a 'pop' valve set at 120 pounds, but had not blown off.

"The gas theorists are now holding up this case as proof positive that theirs is the proper theory of boiler explosions; for here was a boiler that had stood a pressure of 120 pounds every day, up to the time it gave way, then blew up with a tremendous force with a pressure of steam that could not possibly have been more than 60 pounds, was standing on a side track and had not had any water put into her since she had been fired up about three hours previous."

Locks on Bonded Freight Cars.

The Treasury Department has decided that cars containing merchandise for shipment without appraisement may have one of the doors cleated inside instead of being locked, but that the other door must be locked, and the fact specified in the manifest.

OLD AND NEW ROADS.

Southwest Pennsylvania.

The first passenger train passed over this road February 5, from Greensburg to Tarrs, 12 miles. Greensburg is on the Pennsylvania road, 31 miles east of Pittsburgh, and the road extends from that point south to Connellsville, about 25 miles.

Dunning's Creek.

Work has been commenced on this road, which is to extend from Bedford, Pa., north to St. Clairsville, about 12 miles.

Rochester & State Line.

The contract for the bridging on this line has been let, the work to be completed by August 1, 1873.

Wilson & Tar River.

This company was recently organized at Marlboro, Pitt County, N. C., and intends to build a narrow-gauge railroad from Wilson, on the Wilmington & Weldon road, east to the Tar River, in Pitt County, a distance of about 30 miles. John T. Barnes was elected President, and Messrs. A. Branch, E. C. Pellowley, T. R. Cherry, Owen W. Jones and G. W. Blount were elected directors.

Winchester & Alabama.

The advertised re-sale of this road has been postponed until after May 1, 1873, by the Tennessee Legislature. The road was purchased by the Memphis & Charleston Company, but the terms of the sale have not been complied with. The Southern Security Company, when it leased the Memphis & Charleston, did not take the Winchester & Alabama, but the Memphis Company will now, it is said, make an effort to raise the necessary means to make the payments due the State and thus complete the contract.

Memphis & Charleston.

The directors of this company have resolved to issue \$600,000 in 10 per cent. bonds, secured by mortgage on the franchise of the company and the rental due from the Southern Security Company. An effort is being made to secure from the Tennessee Legislature the exemption of these bonds from the 5 per cent. tax now imposed by law. Half of these bonds are to be paid in three and the balance in ten years, and the proceeds are to be used in paying off the floating debt of the company, including payments due the State of Tennessee.

Missouri, Kansas & Texas.

A telegram from Parsons, Kan., says that orders have been given for the speedy completion of the extension from Sedalia, Mo., the present northern terminus, to Moberly, on the St. Louis, Kansas City & Northern road. The grading on this line, which is 72 miles long, is completed, and only the track-laying and ballasting remain to be done.

Surveys are being made for an extension of the Osage Division westward from its present terminus at Paola, Kansas.

Cincinnati Southern.

The surveys for the main line from Cincinnati to Knoxville, Tenn., have been completed, and it is said the final location of the line will shortly be decided upon and contracts let.

Buffalo, Corry & Pittsburgh.

It is stated that since this road passed into the hands of the Allegheny Valley Company, nearly \$100,000 has been expended in improving its condition. New rails have been laid and new rolling stock provided, and as soon as spring opens the road will be ballasted and the work of filling in the numerous trestles on the line commenced.

Green Bay & Lake Pepin.

The managers of this company propose to change the route of the western end of their line by turning southwest from Merillton, the present terminus, and running to Winona, Minn., instead of Wabashaw, the point first proposed, provided Winona will offer sufficient inducements. The people of that city propose to transfer to the Green Bay Company \$100,000 in bonds voted some time since to the Winona & Southwestern Company.

Pennsylvania & Delaware.

This road, from Landenburg, Pa., to Pomeroy on the Pennsylvania road, 41 miles west of Philadelphia, has been leased to the Wilmington & Western Railroad Company, whose road extends from Wilmington, Del., to Landenburg. The road is nearly completed and trains will be run over it by the lessees as soon as the connection with the Pennsylvania road at Pomeroy can be completed.

Bainbridge, Outhbert & Columbus.

This road, which was intended to run from Columbus, Ga., to Tallahassee, Fla., and on which some grading has been done, was sold at Outhbert, Ga., February 11, for \$90,000, to Colonel Gibbs, of Quincy, Fla.

Wheeling, Pittsburgh & Baltimore.

The Wheeling (West Va.) *Intelligencer*, of February 19, says that at a recent meeting of the board of directors of this company, it was resolved to build a railroad from Washington, Pa., to the line of the Pittsburgh, Washington & Baltimore via Monongahela City. This is supposed to be in addition to the line now under construction by way of Belle Vernon. The new road is to be known as the Ohio & Baltimore Short Line.

Port Royal.

The bridge over the Savannah at Sand Bar Ferry is completed. Track-laying is progressing well, and it is hoped the road will be finished by March 1.

Spartanburg & Union.

Southern papers report that this road was purchased at the recent sale in the interest of the Southern Railway Security Company, and that that company purposes to extend the Cincinnati, Cumberland Gap & Charleston road (which is now completed from Morristown, Tenn., on the East Tennessee, Virginia & Georgia southwest 40 miles to Wolf Creek) from its present terminus to a connection with the Spartanburg & Union.

at Spartanburg, S. C. This extension would be 110 miles long, through a hilly and difficult country.

St. Paul & Sioux City.

Several new locomotives and 150 freight cars have been ordered for this road. New rails are to be laid the coming summer on the old part of the road from St. Paul to Shakopee.

Galveston, Houston & Henderson.

A controversy is going on between this company and the Houston & Texas Central. It appears that the mail train from Galveston to Houston under the present schedule arrives in Houston 15 minutes after the leaving time of the Houston & Texas Central train. Neither company is willing to alter its time table, and consequently the mail from Galveston, which is very large, including that coming by steamer from New Orleans, lies over at Houston for 24 hours, much to the inconvenience of the people of the interior towns.

Lewiston Suspension Bridge.

The Rochester (N. Y.) *Union*, of recent date, says: "A meeting was recently held in Hamilton, Ont., of representatives from the Great Western, Lake Ontario Shore and Lewiston Suspension Bridge Companies, at which arrangements were completed for the immediate construction of the bridge. The Lake Ontario Shore and the Great Western Railroad Companies agree to pay four per cent. each on the cost of the bridge for its use for railway purposes, and in case any other road desires to pass over it, a corresponding deduction will be made to those two companies. The construction of the bridge will be commenced immediately."

The Philadelphia Board of Trade on Railroad Freights.

A committee of the Philadelphia Board of Trade has reported the following as desirable legislative restraints on railroad companies:

First. That each railroad company shall publish the rates of freight upon which each class of goods shall be carried over its roadway, with statement of amount of rebate to be allowed on specified quantities of merchandise shipped to one destination or to one consignee, and that any infraction of this regulation shall be visited with a heavy penalty.

Second. That each railroad company shall publish in connection with the above-mentioned freight rates a tariff of charges per mile at which it will furnish roadway and motive power for cars (others than those owned by the company) which may be delivered to it for charge. Any deviation from this published tariff of rates shall be visited in this case, also, with a heavy penalty.

Third. That Congress shall be memorialized for the passage of such laws as shall establish these regulations.

Boston, Hartford & Erie.

The United States Circuit Court in Boston has granted a writ, at the suit of the Erie Railway Company, ordering the above company to show cause why an injunction should not be issued restraining the company from forming any new organization affecting the existing status of the corporation, by foreclosure of the Berdell mortgage, or from selling, assigning, or otherwise disposing of the franchises of the road under such foreclosure. The order is returnable on April 12, when the motion will come up for argument.

Knoxville & Ohio.

A correspondent informs us that this company desires to reduce its principal severe grade, and has advertised for proposals for the work. The grade in question is now 95 feet to the mile, and it is proposed to reduce it to 68 feet to the mile. The change involves the lowering of one mile and the raising of two miles of track and between three and four miles of new earthwork. The road extends from Knoxville, Tenn., north-west 38 miles to Caryville.

Memphis & Little Rock.

The Western Division of this road, from Little Rock to the White River, 48 miles, is advertised to be sold at Little Rock, Ark., March 17, by the trustee for the second-mortgage bondholders.

Memphis & Raleigh.

The rolling stock for this narrow-gauge road, from Memphis, Tenn., to Raleigh, eight miles, has been ordered. It is expected that the road will be completed by May 1.

Chicago & Michigan Lake Shore.

Mr. A. H. Morrison, the General Manager of this company, has presented a memorial to the Legislature of Michigan representing that certain townships voted to issue bonds in aid of this road, that the road could not have been built without such aid, and that the payment of these bonds has been suspended on account of the decision of the Supreme Court of the State. He therefore prays that an act may be passed, giving the company authority to retire these bonds by issuing its own first-mortgage bonds therefor, and that credit may be given the company on the State Auditor's books for the amount of these bonds and accrued interest, to apply in payment of the specific taxes due to the State by the company, until the whole amount of the bonds and interest shall be covered.

Los Angeles & San Pedro.

The annual report of this company to the Secretary of State of California shows that during the last year 38,611 tons of freight were transported, and the receipts were \$167,978.77 and the expenditures \$115,791.64. Of the capital stock of \$500,000, the sum of \$30,002.50 was paid in during the year, making the whole amount paid in \$341,930. The indebtedness of the company is \$35,767.42.

Gilbert Elevated Railroad.

The announcement is repeated that the contract for the construction of a section of this road on the west of Broadway, New York, to the Central Park has been awarded to the New England Iron Company, that \$5,000,000 of its bonds have been sold in England, and that a large amount of stock has been sold. The contract for the masonry foundations for the posts remains to be let. It is also reported that the contractors have 2,000 men engaged on the iron work, and that this will be put up from four different points at once, and that the officers of the company are confident that the line will be completed from Chambers street to Central Park by August next.

New York, Boston & Montreal.

The company has completed a contract with H. A. St. John for completing the rock cut at Tarrytown Heights by the first of July. The contractor is to forfeit \$10,000 if the work is not completed by that time. Night work was to be begun March 1. The trestle work at East Tarrytown is to be completed by the 6th of June.

Easton & Amboy.

The route of this road, which is to be the eastern outlet of the Lehigh Valley road through New Jersey, is fully described by the Chief Engineer of the latter company in his annual report. From Phillipsburg the line runs parallel with the New Jersey Central to Valley Station, about 10 miles, crossing the Lopatcong and Patcong valleys on iron viaducts and the Musconetcong by an earth embankment. Near Valley Station the road will pass through a tunnel 5,000 feet long to Paterson, thence across the Central road to the South Branch of the Raritan and down the South Branch to Bound Brook, crossing the South Branch Railroad on a bridge near Neshanic. From Bound Brook to New Market, three miles, the line runs parallel to the Central and then turns southeast to Perth Amboy,

crossing the New Jersey road under grade at Metuchen. The length of the line will be about 60 miles from Phillipsburg to the docks at Perth Amboy. Of this line 25.4 per cent. is in curves, there being three of five and five of four degrees, the remainder being under three degrees. The tangents vary from 1,000 feet to 8½ miles in length. The highest grade is 17 feet to the mile and on 40½ miles the grade is under 14 feet. The heaviest work on the line is on the Paterson tunnel, where work has been going on some time. The open cut at the east end is finished and the heading driven in 200 feet. At the west end a slope has been sunk striking the tunnel 900 feet from the end and a heading is being driven from this slope. It is expected that this tunnel will be completed by April 1, 1874. Work is going on at other points, three locomotives and four steam excavators being in use, and over \$500,000 has already been expended. The tunnel, bridges and cuts are being built for double track.

Memphis, Carthage & Northwestern.

This road was opened for business to Minersville, Mo., February 22. Minerverville is 10 miles beyond Carthage, the late terminus, and 36 miles from Pierce City, on the Atlantic & Pacific, the starting point of the road.

Morgan's Louisiana & Texas.

The New Orleans *Picayune* says that during the past season a branch of this road from Terrebonne Station, 55 miles west of New Orleans, southeast 15 miles to Houma, was completed and is now being operated. Large additions have been made to the rolling stock during the past year, and improvements made in the shops at Algiers and the wharf accommodations at Brashear City, the western terminus.

New York & Oswego Midland—New Jersey Division.

The bridge over the Erie Railway tracks near the west end of the Bergen Tunnel and the trestle-work approaches to it have been completed and trains now pass over it. Heretofore the crossing has been at grade.

Canada Southern.

The last rail on this road was laid February 20, at a point 64 miles west of Fort Erie. Tracklaying is now completed, and it only remains to finish the ballasting before the road can be opened for business.

Buffalo, New York & Philadelphia.

The Buffalo (N. Y.) *Courier* says that this company has about concluded a contract with the Empire Fast Freight Line, by which freight will be carried from Buffalo to all points on the Philadelphia & Erie and Pennsylvania roads.

Frederick & Pennsylvania Line.

Arrangements are being made for the extension of this road from Frederick, Md., to Washington. The road will be built under a Maryland charter to the District of Columbia line, and a company is to be organized at once to continue the road from the District line into the city of Washington. Application for a charter will shortly be made to Congress.

Knox & Lincoln.

The towns on the line of this road which issued their bonds in aid of its construction have been called upon to pay the interest due, the earnings of the road being insufficient to meet the payment.

Great Western.

The new Air Line has been formally opened for freight traffic from the junction with the main line at Glencoe, Ont., to the Welland Junction. Five freight trains will be run each way daily, with a passenger car attached for the convenience of local travel. The stations on the new line are: Glencoe, Thames River, Canada Southern Crossing (west), St. Thomas, Canada Southern Crossing (east), Aylmer, Corinth, Tilsonburgh, Caledonia, Delhi, Niverville, Simcoe, Jarvis, Nelles Corners, Cayuga, Grand Trunk Crossing, Darling Road Siding, Michigan Road Siding, Marashville, Welland Canal, Welland Junction, Stevensville, Fort Erie, Black Rock, Erie Street Depot, Buffalo.

The line is laid with steel rails, and is said to be solidly built and in very good condition.

Connecticut Valley.

It is reported that this road will be leased by the New York, New Haven & Hartford Company. The road is 44 miles long, and runs from Hartford south along the Connecticut River to Saybrook Point on Long Island Sound.

Pennsylvania—New York Division.

Work on the branch line to the new docks in Harsimus Cove has been commenced. Pile-drivers are at work putting down piles for the road across the flats back of Jersey City. The work on the docks has been almost suspended on account of ice in the river, the dredging machines being unable to work.

Grand Trunk.

A committee of the Michigan Legislature has been investigating charges made against this company by the Detroit Board of Trade. It is charged that there is unnecessary delay of freight shipped over the road, and that discriminations are made in favor of freight coming from the West as against shipments made from Detroit.

New Orleans, Mobile & Texas.

The track on the Louisiana Division is now laid 10 miles beyond Donaldsonville, La., and the grading is substantially completed for 24 miles further. The bridge over Grand River has been completed, and some 20 miles of grading done between that point and Vermillionville. A large force of men is at work on the line and grading is progressing rapidly.

Atlantic & Great Western.

At a special meeting held February 20, in New York, the stockholders ratified the leases made by the board of directors of the Pennsylvania Petroleum, the Pithole Valley and the Shenango & Allegheny railroads.

Union Pacific.

In Congress the report of what is known as the "Wilson Committee" of the House of Representatives with reference to this company and the Credit Mobilier says that in incorporating the Union Pacific Railroad Company the Government intended to subserve the country's as well as the company's interests. It estimates the cost of the road at \$50,000,000, and the profit to the builders at \$23,000,000, and censures the company for distributing a part of its capital as dividends, and for using borrowed money for the same purpose. Congress may not accept the general intentions of persons jointly engaged in these transactions as an excuse for deliberate violation of its laws. Many persons have openly held Credit Mobilier stock with no apparent share in the mismanagement. Some of these hold high public positions, and it is difficult for the Committee to believe them implicated. No misconduct of the present management has been discovered; the facts of the old mismanagement would justify the forfeiture of the corporation franchise, but not the rights of the innocent stockholders. When bonds are held, not in good faith, but illegally, the United States should refuse to pay. The Committee recommends the passage of a bill, accompanying its report, which amends the act of incorporation to secure the rights of the United States and the people in the road. It provides that a suit in equity be instituted by the Government against the road and the holders of capital stock thereof not fully paid for, and who have received unlawful dividends, or who hold from the United States bonds, moneys, or lands belonging to the corporation, to compel restitution; that the suit may be tried in any Circuit Court, the

decree in case of any defendant holding good for all similar cases; that the books of the company be always open to the inspection of the Secretary of the Treasury; that the bankruptcy laws shall not apply to this corporation; that no future dividends be declared except from earnings, no new stock issued or loan negotiated without leave of Congress, except for funding the existing debt or renewals thereof; that no director or officer shall be interested in any contract with the road except for his salary, and that any director or officer infringing the prohibitions in regard to dividends and loans be punished by imprisonment of not more than two years and by fine of not more than \$5,000.

Railroad Legislation.

The Indiana Legislature has passed a bill to regulate railroad charges, by which three cents per mile is made the maximum rate for carrying passengers, and the charges for freight are to be based on through rates, an increase of 100 per cent. on the through rate being permitted for distances of 20 miles or less; of 75 per cent. for distances from 20 to 50 miles; and for greater distances for local freights not more than 50 per cent.

The Iowa Legislature has passed a law making 3½ cents the maximum rate for carrying passengers on all railroads whose earnings exceed \$4,000 per mile. Very few railroads wholly in Iowa have ever earned dividends.

Atlantic & Great Western.

At a meeting of this company, February 20, the lease of the Pithole Valley Railroad, the Shenango & Allegheny Railroad and the Pennsylvania Petroleum Railway was ratified. The company has issued a loan of \$6,360,000, secured by the leases of these roads, \$4,500,000 of which has been negotiated.

New York & Harlem.

Last week this company received proposals for the purchase of \$3,000,000 of its 7 per cent. bonds, due in 1900, which it had invited by advertisement. Bids were received for \$2,000,000, and, of these, offers for \$1,000,000, at from 102½ to 102¾ were accepted.

Greenville & Columbia.

In the matter of the petition of Daniel Scannel and Charles Maddox, of New York, ns, the Greenville and Columbia Railroad, of South Carolina, being a petition for a review, by Judge Bond, of the United States Circuit Court, sitting in Chambers, at Baltimore, of the decision of District Judge Bryan, of South Carolina, declaring the said railroad company not a bankrupt, Judge Bond has decided not to review the decision of the court below, and to allow the order of Judge Bryan to remain unchanged. The application of the petitioners arose out of the failure of the company to pay its coupons, they being holders of the bonds and coupons of said company to the amount of about eight hundred thousand dollars. The legal questions involved in this decision are—First, is a railroad company liable to bankruptcy? Secondly, are the coupons of a railroad company commercial paper? and, thirdly, is the decision of a district judge to be reviewed by a petition, or by a writ of error?

Atlantic & Gulf.

This company is now endeavoring to obtain aid from the State of Georgia to enable it to extend its road from the present terminus at Bainbridge, Ga., west to Pollard, Ala., on the Mobile & Montgomery road. The length of the extension would be about 165 miles, and it would complete a line from Savannah to Mobile. The country through which the extension would pass is thinly populated and very barren.

Missisquoi & Clyde Rivers.

The first train passed over this road from Richford, Vt., to Newport, 32 miles, February 14. At Newport the road connects with the Connecticut & Passumpsic Rivers road, and it is extended from Richford to West Farnham, Can., by the South-Eastern Counties Junction road, forming part of a new line to Montreal from Boston.

Nashua & Rochester.

A contract has been made with the Portland (Me.) Rolling Mill for 2,000 tons of rails for this road.

Stockton & Ione.

This company was organized in Stockton, Cal., February 13, E. S. Holden being President, H. E. Hall, Secretary, and E. B. Stockwell, Treasurer. The company intends to build a narrow-gauge road from Stockton to Ione, about 30 miles.

Vermont & Canada.

A petition has been filed in the Court of Chancery at St. Albans, Vt., for the removal of the present managers on the ground that they have fraudulently mismanaged the road. The petition is signed by owners of \$183,000 of the first-mortgage bonds. It is alleged that the managers have perverted the funds of the road to improper uses, that they have issued stock without authority, that they have made fraudulent contracts with car and transportation companies, that they have leased other roads without authority, have used money in bribing officials of those roads, in order to obtain favorable leases, and that they have generally mismanaged the road, diverted its funds from their proper uses and exceeded the authority granted them by the court.

Cairo & Fulton.

Trains began to make regular trips between St. Louis and Little Rock on the 6th inst.

Discussion of the Gauge Question.

[Continued from page 80.]

GROUND ON WHICH THE NARROW-GAUGE PLAN RESTS ITSELF.
This then is the ground upon which they take their stand, and is the pivot upon which their system turns, viz.: that the narrowing of the standard-gauge to what they propose is indispensable to the production of the economic results which they promise.

Finding that my letter has gone into more detail than I had designed, and is extending, I fear, to an unreasonable length, I will offer such more general remarks as occur to me upon this point, and leave the subject for the present in your hands.

MUST WE NARROW THE GAUGE IN ORDER TO LIGHTEN THE MACHINERY.

If, then, for argument's sake, we concede that locomotives and cars must be made lighter *absolutely*, as well as relatively to the loads they are to carry, in order that the track upon which they run may be made lighter and less expensive to construct and repair, and transportation upon it be done more cheaply, must we, in order to effect these objects, contract the present standard-gauge of 4 feet 8½ inches to some reduced width, say 3 feet?

Treating the question, first on general principles, we observe that the size and weight of any material body depend on its length and height as well as on its breadth, so that as we increase the breadth we may reduce the length and height and still retain the same cubic contents. We may then make engines and cars wider without necessarily increasing their bulk and weight, if we proportionately lessen either of the other dimensions, or both. Bearing in mind, then, that the gross weight of the train to be hauled is to be the same, and the tractive power of the engine therefore necessarily the same, we can place upon a 4 ft. 8½ in. gauge track a train which will weigh no more than the train upon the 3-foot gauge track, and yet will carry the

same passengers or tons of freight, and consequently earn as much as the other? Now as regards the engine, it is clear that its effective or adhesive weight must be the same on both gauges, as upon that depends absolutely its power of draft to overcome the resistances from gravity and friction upon the road, which must be the same, as the location is assumed to be identical and the roads in all respects alike, with the single exception of the gauge of track.

EFFECT OF GAUGE ON RESISTANCE ON CURVES.

It will probably be said here, that even with the same precise location the resistance on the curves will be the greater on the standard gauge, and hence the engine should be more powerful and consequently heavier, more costly and more injurious to the track. But this additional resistance on the curves on the wider gauge is a very small matter when examined, for even on a curve of so short a radius as 230 feet, which it seems is to be used in passing through the "Clear Creek Cañon," Colorado, on the "Pine Bluff & Nevada" Railway above referred to, the difference in the length of the two rails is, upon an entire circle turned with that radius and consequently about 1,333 feet in circumference, only about 11 feet the most on the standard gauge, or 8-10 of one per cent. of the whole distance.

To meet these occasional resistances, there must always be a surplus power in the locomotive, and the increased amount of that surplus for the standard-gauge engine would be inappreciably small. Such curves, however, are, or should be, altogether exceptional upon roads of leading character; yet they can be safely traversed by standard-gauge engines, at suitable speed, which must be slow upon any gauge, as even the famous "Festiniog" of 2-feet gauge can scarcely maintain, with safety, its alleged speed of 30 miles per hour upon its curves of 132 feet radius, even with an elevation so great as 3 inches, or 1 in 8, in the breadth of its track.

Such performances would certainly recall those of the circus ring. Indeed high speeds, on very curved roads, however safe, are to be deprecated, on account of increased wear of track, and the nausea produced in passengers of sensitive stomachs, as travelers can testify.

The locomotive then upon a 3-feet gauge must be of equal weight and tractive power with that of the standard gauge, and being less than $\frac{1}{3}$ of its width must be proportionally longer, and so grind more in the sharp curves, on account of its greater wheel-base and obliquity of draft, even if it be on the "double-bogie" model (which is equally applicable to both gauges), and in this way will probably quite equal the disadvantage of the greater difference of length of rail in the standard gauge.

COMPARISON OF CARS ON THE TWO GAUGES.

Now as to the cars, the capacity of which for either passengers or freight depends upon the area of their floor, we know that the nearer a parallelogram approaches to the square, in the length of its sides, the more space it will inclose with a given outline. If we take the standard-gauge passenger car of $\frac{9}{2}$ feet outside and 9 feet inside width, and say 40 feet inside length, we have a floor area of 360 square feet, while to obtain the same area in a car of 7 feet outside and 6 $\frac{1}{2}$ inside dimensions (I notice that the passenger cars for the Denver & Rio Grande Railway are to be 7 feet wide inside) the length must be 55.4 feet, the total length of sides and ends in the two cars will be as 99 to 124. So with a standard freight car 7 $\frac{1}{2}$ feet wide and 28 feet long inside, we have 210 square feet, and with a 3-feet gauge car, with an inside width of 6 feet, the length must be 40 feet, the total length of sides and ends being as 71 to 92. The excess of length in the narrow-gauge cars would necessitate the widening of cuttings on the very short curves proposed for them beyond what the shorter cars of the standard gauge would require.

The quantity of material in the floors and the roof, where there is one, will be the same; but it will not only be greater in the preceding proportion in the sides and ends combined, but the lengthwise timbers, upon which the strength of the body mainly depends, will be much heavier and more expensive in the narrow-gauge cars, while the transverse timbers of both body and trucks, being short and of sizes more easily obtained, will cost more in the wider car only in strict proportion to their increased length and section. The more compact form of the wide car will also make it stiffer against lateral and diagonal strains, and it will therefore require less bracing. So much for the car body. The truck frames will be somewhat heavier and more costly on the standard gauge on account of their greater width, their length being the same, and the axles will be larger and heavier and the wheels will be heavier if they are of the usual diameter of 31 to 33 inches, while it is proposed to make the narrow-gauge wheels but 24 inches. Hence the chief gain in economy of weight and cost of the latter gauge will be in the trucks, but perhaps not much more than will be lost on the bodies, and, in offset of this, the smaller wheels will offer much more resistance to traction, and will wear out much faster, as they will have to revolve one-third more times in a mile than the larger wheel, supposing it to average 32 inches diameter. The wear of the rails, too, especially at the joints, must be greater with the small wheel.

NO MORE DEAD WEIGHT NECESSARY ON STANDARD GAUGE.

From these considerations we may, I think, reasonably conclude that upon the standard gauge of 4 ft. 8 in. trains can be placed and run with as little dead weight and cost as upon a gauge of 3 feet. The engines and cars being assumed, as they should for fair comparison, to be of equally good work and style of finish throughout. The narrow-gauge advocates seem to claim the "double-bogie" or Fairlie engine as peculiarly their own, and with the very abrupt curves they propose to use it may possibly be the best form for them. I do not, however, consider it necessary to discuss its merits here, for whatever they may be they are fully as available for the standard gauge as for the other.

In reading the performances of this engine on the Festiniog road, I was struck with the enormous steam pressures used, necessitated, I presume, by the contracted boiler and steam space and small cylinders on so narrow a track.

RELATIVE LATERAL STABILITY.

I notice in one or two of the narrow-gauge pamphlets the question of lateral stability of cars on that gauge touched upon, and, I think, with the incorrect conclusion that they are even less liable to overturn than the standard-gauge cars in the ratio of 27 to 42. This position is illustrated by a diagram drawn to a scale, and from it I calculate that, having due reference to the centers of gravity and of revolution, the standard-gauge car was the most stable upon a track level crosswise in the ratio of 15.64-100 to 13.78-100, which, if I am right, reverses the position of matters. If the rails are equally out of level in both gauges, it would be still worse for the narrow gauge.

ENGINES AND CARS NO HEAVIER OR MORE COSTLY ON STANDARD GAUGE.

Reasoning, then, from the preceding principles, I deem that a gauge of 4 ft. 8 in. can be operated with engines and cars no heavier or more expensive than those of a 3-feet gauge carrying the same loads and with the same earnings, so that if we must lighten and cheapen our rolling stock, it can be done as well upon the standard as upon any narrower gauge. If the trains, then, are no heavier, the rails and fastenings need be no heavier, nor need the bearing surface on the ballast (if it be used) be greater—the weights to be borne being the same—and hence, the 3-feet gauge cross-ties being spaced as the standard ones, they should be of equal length and the ballast should be of equal width to support them. The standard-gauge track,

then, for such trains, may be built and maintained as cheaply as the 3-feet gauge.

HISTORY OF RAILWAY PROGRESS.

In confirmation of these views we may refer to the past history of the railway system, both in Europe and America, which, started upon the standard gauge, has run its career from childhood to manhood upon it, and will not be likely to desert it in its still advancing maturity. The Liverpool & Manchester Railway began with the "Rocket" of 4 $\frac{1}{2}$ tons in 1829, upon a rail of 35 pounds per yard. In the six years following it had increased the weight of its passenger engines to about 9 tons and its freight engines to 11 $\frac{1}{2}$ tons, with a considerable increase in the weight of rail, and, up to a certain time thereafter, with a progressive increase of engine and rail.

The Baltimore & Ohio Railroad, the "pioneer" railroad of the United States for general transportation, began to open its road by sections in 1830 with a plate rail of about 14 pounds per yard upon a longitudinal bearing timber 6x6 inches, on which structure, in 1832, it placed its first locomotive of 6 $\frac{1}{2}$ tons. In 1836 it had increased the weight of its engines up to about 9 tons, and this progressive increase continued until in 1844 their weight had advanced to 20 tons. In 1838 a part of their track was relaid with a T rail of 52 pounds per yard, and their new road beyond Harper's Ferry was laid with a rail of that weight in 1842; but the general reconstruction of their old superstructure was not entered upon until 1846, when it was rebuilt with a similar rail. Their earliest engines (6 $\frac{1}{2}$ to 8 $\frac{1}{2}$ tons) had upright boilers with all the four 3-feet wheels connected, were very powerful for their weight, and would traverse curves of 60 feet radius, and so would have well suited the hard curves of the narrow gauge.

The other railroads of the country, which closely followed the Baltimore & Ohio in their commencement and prosecuted their lines *pari passu*, had a similar early history, beginning with light plate rails of 14 pounds and T rails of 38 to 45 pounds, and engines of 8 to 12 tons, and gradually increasing the weight of both as the expansion of their business demanded. Those very light 35 and 40 pound T rails, except when supported by timber longitudinals, did not last long, even under the light 8 and 10 ton engines and proportionately light cars of those days, and the 90-pound rails now proposed for some of the narrow-gauge roads, on which engines of 15 tons are to ply with cars no lighter than those just mentioned, would soon be found wholly insufficient for the wear and tear to which they would be subjected, especially upon the abrupt curves which are claimed to be, if not a commendable, yet an allowable feature of those roads.

APPEAL TO EXPERIENCE.

Indeed, to return, in the face of the speaking experience of the past, to a style of structure slighter than that of five and thirty years back, and yet intended to carry locomotives 50 per cent. heavier than those then in use and cars which, however light when empty, would be loaded to more than double the tonnage then put upon them, would seem to look *exceedingly* unwise.

How the reduction of the gauge from 4 ft. 8 in. to 3 ft. or to 3 ft. 6 in., or to any other number of feet and inches less than the present standard, is to obviate all the mischiefs which must inevitably attend the running of heavy trains upon a fragile track, I confess myself unable to perceive. It will probably be said that the greater proportion of paying weight will more than balance the increased cost of maintaining the track; but I think I have shown that the same economic results, whatever they may be, can as well be realized upon the standard gauge. Why then abandon it and introduce a new element of confusion into our system of gauges, already complicated by some of an exceptional character?

Do not the champions of the new narrow gauge see that the advantage in the weight of rails, engines and cars must necessarily have been the effect of irresistible causes, which, to some extent, are still in operation, although they may have brought those weights to a maximum?

It was because the light track and machinery could not do the business which offered in rapidly increasing amount that they were forced made heavier. A careful study of railway reports will show all this, and that as the weight of engines increased the cost of transportation through their means diminished, notwithstanding the stronger tracks they required and the increased expense of maintaining them under the enlarged business. It is true that the expense per ton and per passenger per mile may be greater now than at an earlier period; but that is mainly due to the higher price of labor and materials, while the net profit and dividends upon many lines have been reduced by the low rates of charge resulting from competition for business or from the larger proportion of such freight carried as will bear only small charges.

FURTHER REMARKS ON RELATIVE COST OF CONSTRUCTION.

To return to the subject of the first cost of construction upon the standard as compared with the 3-feet gauge, I think I have shown that the cost of graduation upon a line of light work averaging say 5-foot cutting, the increase would not be more than 15 per cent. upon single and 10 $\frac{1}{2}$ per cent. upon double track, and for a line of heavy work averaging 20 feet cutting, 7 $\frac{1}{2}$ -10 and 12-20 per cent. for single and double track respectively. The cuttings are assumed to be in earth, with slopes of 1 to 1; with rock slopes of 1 to 4 the proportion (so far as that material occurred in the excavation) would be more favorable to the narrow gauge by about 4 per cent. for single and 3 $\frac{1}{2}$ per cent. for double track, upon the light lines and for the heavy lines by about 7 per cent. for single and the same for double track. In tunnels the saving would be 5 $\frac{1}{2}$ cubic yards, double track, and 2 $\frac{1}{2}$ cubic yards single track, per linear foot; but tunnels must be few and short upon a gauge the boast of which is that it saves their necessity.

Now these savings on the graduation of the road-bed, when compared with those claimed by the authors of the publications I have seen, are quite inconsiderable, and very great deductions must surely be made from their comparative estimates of this item, which are altogether most extravagant.

I think I have shown, also, that for trains of similar weights the standard-gauge track can be built as cheaply as the 3-feet gauge, the bearing surfaces on ballast or roadbed being the same, as they should be to do similar duty. In all masonry covered by embankments the saving in quantities will be in proportion to the relative breadth of the banks, or in the ratio of 12 to 13.7 in single and 21 to 25.2 in double track. This saving will usually be a very moderate one per mile of road.

In the abutments and piers of bridges the narrow gauge cannot claim much if any economy. The foundation work will be absolutely the same, and the length and breadth of masonry must be determined, not only by its resistance to the current, but by the dimensions of the superstructure, which for similar spans should be the same, without regard to the width of track or cars, as its lateral stiffness decides what its width must be, so there can be no material reduction in piers and abutments.

In piling or trellising a trifle may perhaps be saved by slight reduction in the transverse timbers, and in them only to the extent of the 1 ft. 8 $\frac{1}{2}$ in. difference in gauge. A less width to that the standard gauge would require is, however, scarcely advisable for working room in repairs and for appearance sake with a view to the comfort of nervous travelers.

The saving in land and right of way must be so small as to be scarcely noticeable. Water houses and tanks and station buildings must evidently be the same for all gauges on which the same amount of business is done, and in engine-houses and

work-shops whatever might be saved in width would be lost in length of structure.

ENGINES AND CARS MAY BE MADE OF SAME WIDTH ON STANDARD AS ON NARROW GAUGE.

The preceding comparisons have, however, all proceeded upon a hypothesis of a difference of 2 $\frac{1}{2}$ feet in the width of passenger cars, as they govern the breadth of the road in cuttings and tunnels. Now if, as the advocates of the narrow gauge aver, all the comfort and convenience which the traveling public demand can be supplied in a car of 7 feet in outside width, then we have only to make that the standard breadth for the standard gauge, and the lateral dimensions of all the works of that gauge become identical with those of the narrow gauge. All that is necessary is to move each rail out 10 $\frac{1}{2}$ inches from the center of the track, and you reduce the overhang on each side of the 7 feet passenger car from 2 feet to 1.15 feet, with a great increase of steadiness of movement. The original width of such cars on the standard gauge, indeed, very little exceeded that, and they have reached their present increased breadth in consequence of the exactions of a public not easily satisfied with anything short of luxurious ease in traveling. Freight cars may, of course, be kept within the same external width, and, adopting it for the cars, it must also be applied to the locomotives. This would, indeed, contract their width about a foot, somewhat to their disadvantage, for engine builders have often expressed the opinion that a few inches more than that allowed by the 4 ft. 8 $\frac{1}{2}$ in. gauge would enable them to make better disposition of parts of the machine. The difficulty is of course greatly increased upon the narrow 3-feet gauge, as of course the overhang allowable in a car is not allowable in an engine.

SUMMARY OF POINTS DISCUSSED.

While tempted to notice more at length the publications of the advocates of the narrow-gauge system, I must now, however, sum up in as few words as possible the substance of what I have been endeavoring to show in the preceding remarks, viz:

1st. That the railway with its gauge, its locomotives, its cars, its buildings, and appurtenances of every description, being the slow growth, during nearly half a century, of the expanding intelligence, experience, tastes, wants and wealth of the civilized world, cannot be turned back from the period of its preaut vigorous manhood to the days of its feeble adolescence.

2d. That if it has overpassed, in some degree, the bounds of primitive simplicity and rigid economy which became its early youth, and it, in order to apply it in a less perfect and costly shape to new regions of sparse population and slender present resources, it be necessary to cheapen its road-bed, track and machinery as much as may consist with efficiency in its working, this can be done without any change in the standard gauge of the country, as well and as cheaply as by a reduction of that gauge which would disastrously disconnect the different parts of what would otherwise form a harmonious whole.

REFERENCE TO WRITERS ON THE QUESTION.

I have the pleasure of knowing personally, or by correspondence, several of the professional gentlemen who have taken part in what has been published in favor of the new system; and, while I have a high respect for their talents, worth and standing in their profession, I must confess my surprise at the extent to which they have been carried away by what appears to me a delusive idea. Some of the writers have expressed themselves more temperately and discreetly than others, but all have imbibed the most inflated notions of what so simple a thing as laying the two rails of a track a little closer together is to accomplish in railway economy. I admit that if much smaller advantages and projects than they predict were certain to be realized after deducting all the manifest disadvantages and losses consequent upon the introduction of a new gauge, it might be resorted to in localities peculiarly suited to its application. Nor do I deny that such localities may exist, but they must, I think, be "low and far between." The narrow-gauge schemes on foot, however, contemplate long lines stretching across the country, almost from sea to sea, and threatening direct competition with existing roads of the standard gauge. If capital can be induced to embark in these enterprises, be it so, and the *experimentum crucis* will have been applied, to the general enlightenment of the world.

NARROW-GAUGE ROADS IN OPERATION.

The champions of the new gauge, however, claim that its success is no longer a question, and they quote the gauge of 3 ft. 7 in. in Norway and Sweden, and that of 3 ft. 6 in. in Russia, as well as two Canadian roads of 3 ft. 6 in., all in successful operation, and carrying freight and passengers at low rates, although not lower than some of the standard-gauge roads in the United States. The Denver & Rio Grande Railroad of 3-feet gauge, of which some 90 miles have been opened, is also said to be a *grand success*. All this may be perfectly true, but "success" is a relative word of broad meaning, and each of these works may be successful in their own isolated spheres of operation. Whether they would not be *more* so if parts of them connected a system covering the entire country to which they belong, is a question which must be answered affirmatively, and, I doubt not, in a degree which would more than warrant the additional expenditure of what capital might be required to make them so. These roads are all as yet new, and it is only necessary to look at a series of the reports of any long established railway to see how steadily the balance sheet exhibits an enlargement of its invested capital. Some of the railroads of this country, as well as of England, began by paying large dividends, which gradually fell off until they ceased for a time and until, by the net earnings, the road was fitted, by new tracks, buildings, rolling stock and other improvements, to resume them. We must wait some years before we can tell whether the narrow-gauge system is to escape the fate of its predecessors.

COMPARISON BETWEEN OLD AND NEW ROADS SHOULD BE FAIRLY MADE.

It is to the last degree unfair to take such a road as the Pennsylvania Central, or any of the great lines of the country, and compare its cost per mile with that of the Denver & Rio Grande, or any new line built with the smallest dimensions in every way and just opened in the crude condition of all new roads, with heavy expenses to encounter for years after in removing slides, flattening slopes, filling up treasies, widening and raising sunken banks, building stations, tanks, engine houses, workshops and all the numerous appendages of a really finished road—if there is yet such a road in existence or even will be.

It is equally unfair to compare the dead weight and the live and paying weight of two such roads until the narrow-gauge road has had as many years of history as the other to strike an average upon, until the narrow cars, which are to carry four or five times their own weight, are proved to be strong enough to stand such loads, and until all the irregularities of an unsteady trade and travel during a long period are experienced, and to which so much non-paying movement of rolling stock is due.

I have seen cars of new models, which began by carrying three times their own weight, strengthened by the addition of new part after part, until they became nearly as heavy as the freight they bore.

The increase in the weight of engines was also in a degree due to the strengthening of their weak parts. Such will be the course of events on the narrow-gauge roads, which, themselves and their machinery, are all in a measure experimental. Let us therefore wait, and if they do prove a "grand success" and fulfill the most sanguine expectations of their friends, I will rejoice as much as the warmest of them, as I own not a stock in any railroad, and am therefore perfectly impartial in my opinions.